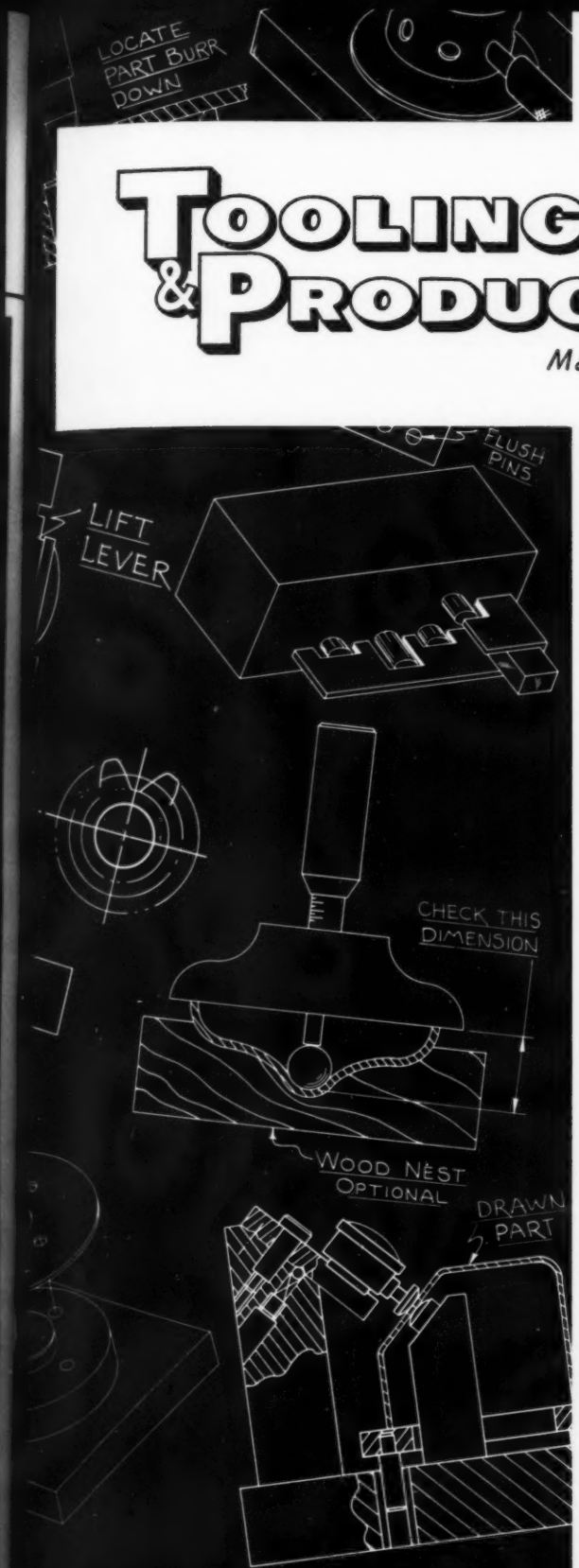
AUGUST 1957

TOOLING & PRODUCTION

Magazine



GAGING TYPICAL STAMPING DETAILS

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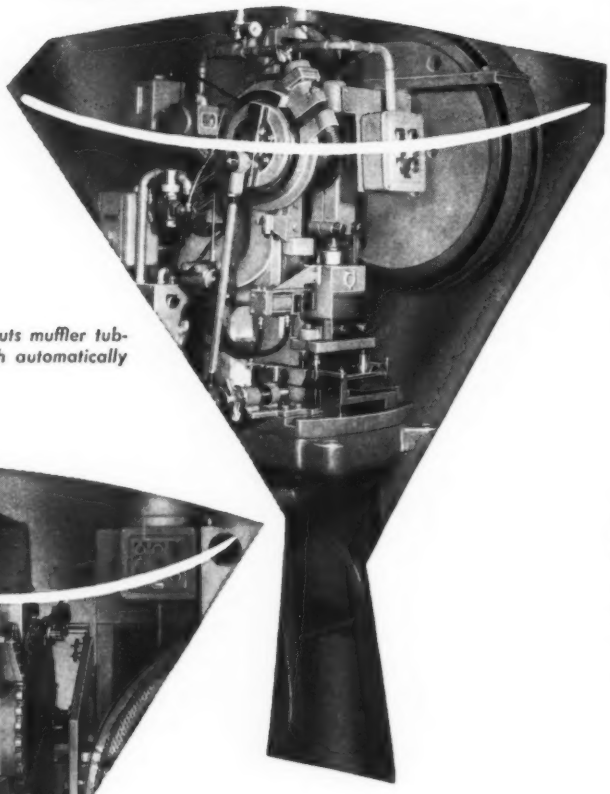
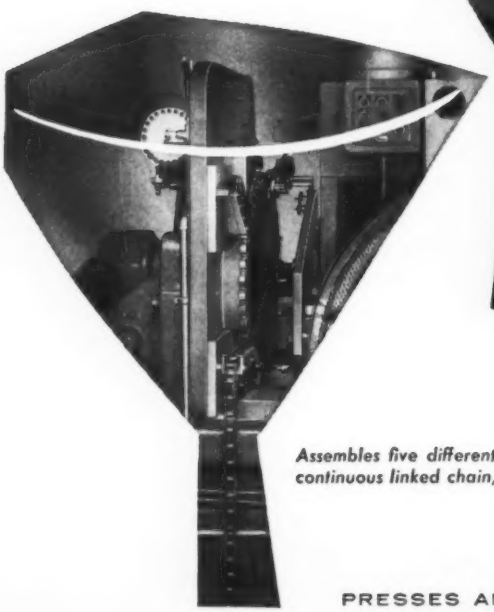
FUNNEL TO SAVINGS IN HANDLING AND MOTION

COMBINED OPERATIONS ON V & O EQUIPPED PRESSES

Stamps out fins in progressive die, then stacks them onto tubes



Feeds and cuts muffler tubing to length automatically



Assembles five different parts into continuous linked chain, spins rivet

Each of the above units (designed and built by V & O) "funnels" two or more operations into an integrated system of parts production. Eliminated are such intermediate tasks as materials-handling between machines, hand-placing of partly finished pieces in dies, and separate inspections of parts in process.

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TOOLING & PRODUCTION Magazine

AUGUST 1957
VOL. XXIII—No. 5
GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T&P Reader:

A couple of weeks ago, Dr. Georges R. Boulanger beat his way out to our suburban publishing offices to pick up copies of a large number of automation articles that have run in T&P. While he was here we had a fine chance to talk with him about the state of mechanization or automation in Europe.

Dr. Boulanger, you see, is a professor at the Polytechnique of Mons and the University of Brussels in Belgium. He holds other titles and honors, not the least of which is the Presidency of the International Association of Cybernetics. He is going to do a series of articles on automation, so we were delighted to help him.

We discussed the great strides American industry has made in automatic production, particularly in metal working. European industry is not nearly as advanced as is ours in the field of the automatic factory. I know that this information comes as no great surprise to many of you, particularly those of you who have been to Europe recently, but it was good to listen to Dr. Boulanger discuss the differences in his colorful way.

It's also good to feel that T&P has helped to spread the gospel of automation for so many years.

Speaking of T&P recently, one of our readers (a Development Engineer for a large Cleveland contract manufacturer) had this to say, "I have one objection and that is we don't receive enough copies of it. My book is all beat up before I get it back to file. Everyone in the department is welcome to read it and when 20 or 30 persons get through with it, it looks like it has been used for a year." Needless to say, there will be more copies of T&P going into this plant.

Maybe you have a similar problem. Believe me, I'd appreciate your dropping me a line, if you have. We don't want to destroy the eyesight of our readers by making them read "dog eared" copies of T&P.

Cordially yours,

Ray Huebner

Publisher

READERSHIP Extension RESEARCH — BPA

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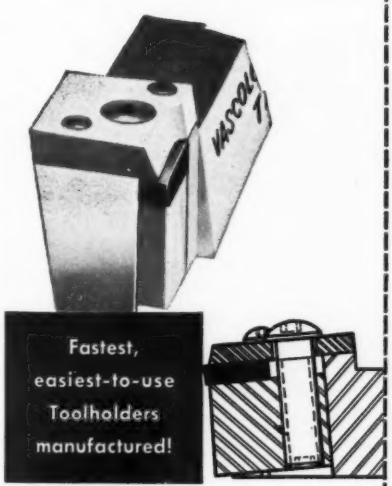
How V-R Toolholder Design Reduces Costly Downtime

1. Insert is clamped in position or released by a turn of the main screw which raises or lowers the exclusive V-R elevator...the single moving part. Nothing to fall out or fumble with.

2. Insert is indexed or replaced in seconds. When you clamp the insert against the chipbreaker plate, it always comes back to the setting, regardless of the thickness of the insert.

3. The main screw is also adjustable from bottom for easy change of inserts when the toolholder is in an inverted position. Another V-R exclusive design feature.



The main screw controls the exclusive elevator. The chipbreaker plate forms the top anvil against which the insert is clamped.

Cutting Edges Changed In Seconds . . .

User Reports 55% Production Increase

The toolholder and clamped-in carbide insert principle continues to make major savings everywhere it is applied. Here is a typical recent example:

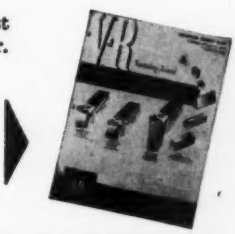
A Rockford, Illinois, company changed from brazed tools on a turret lathe to a V-R toolholder with throw-away inserts. Grinding of carbide tools for this machine, which formerly took 2 to 3 hours per day, has been eliminated. Machine downtime, formerly about one hour per day, is now about 10 minutes. Production has been increased 20 to 25%!

V-R toolholder design has carried the toolholder principle to maximum effectiveness. A single main screw is the only adjustment. Chipbreaker plates are available ground to a standard chipbreaker width or to a specified width at no extra cost. They are also available with zero chipbreaker width for the customer to grind to his own specifications.

All toolholder parts are interchangeable and replaceable.

Both negative and positive rake holders are available to handle 90% of jobs that can be handled by brazed tools.

On job after job, V-R toolholders have proven to cost less to use than brazed tools or any other toolholder. Investigate—get the facts.



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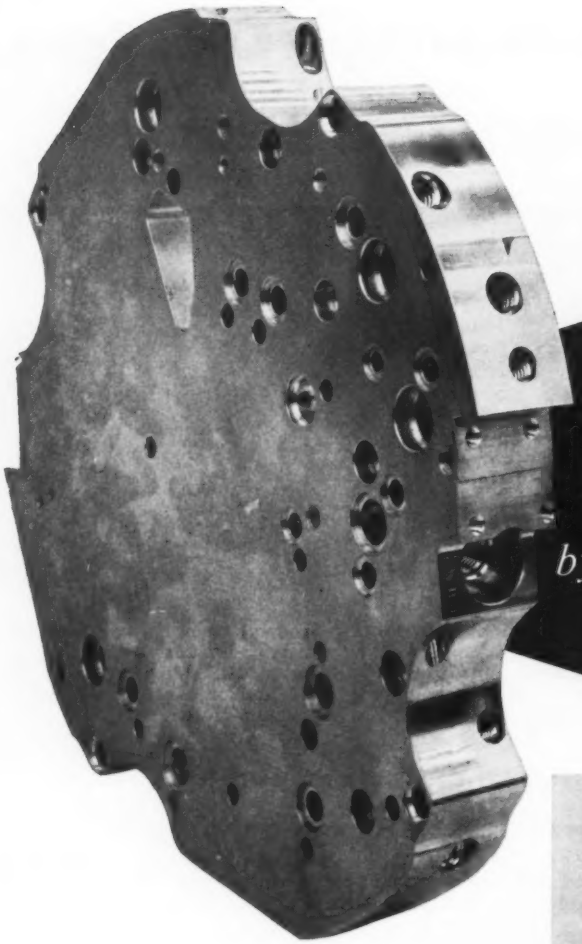
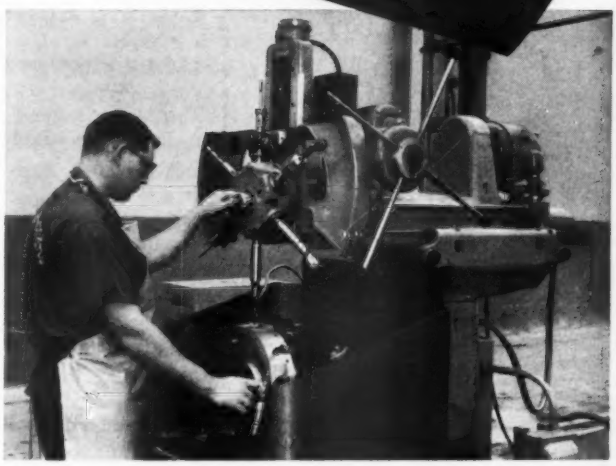


CONVAIR *Brand* *SWISS CHEESE* *by* BURGMASTER® turret drills

Here's how CONVAIR managed this precision work: "The manifold consists of a multi-hole pattern in a magnesium disk over one foot in diameter and almost two inches thick. These holes, to be produced on both faces and the periphery, varied both in depth and diameter, requiring many single and combination tools and taps; all to be held to close tolerances. The solution to this task was found in a tandem of three ram type BURGMASTER radial turret drills. These versatile machines allowed us to produce all the required machining with a minimum of set-up, tooling, operation time, transfer time and maintenance."



The Burgmaster Model 2 BR (6 Spindle) Ram Type Radial Turret Drill with Automatic Power Clamping features power indexing and a new sensitivity in handling. When the ram is clamped in position, the 2 BR can function as a deep throat production turret drill, easily handling holes up to ¾". The machine has a 250° radial movement with maximum and minimum radii of 42" and 15", respectively.

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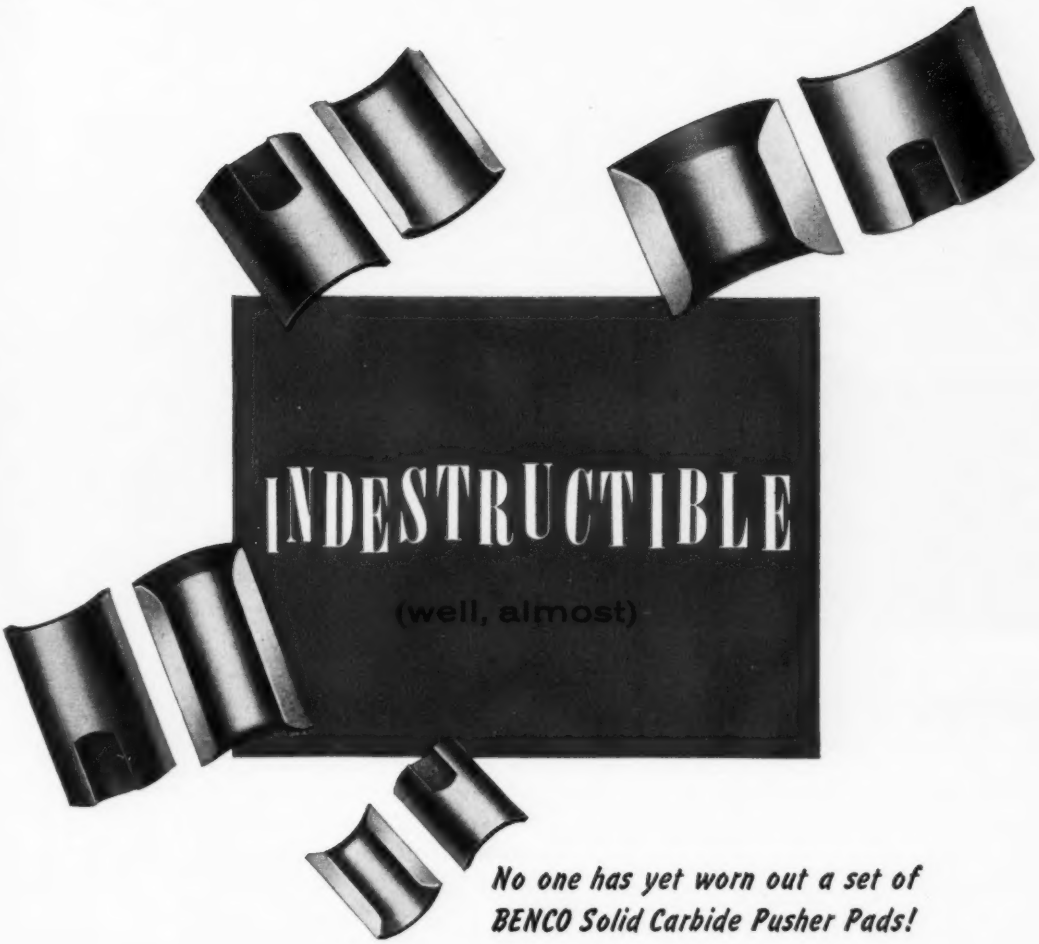

No one has yet worn out a set of BENCO Solid Carbide Pusher Pads!

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Benco Solid Tungsten Carbide Pusher Pads for our standard Model "A" Master Pushers have a life expectancy of at least 35 times that of steel pads...in addition, they are non-scratching and non-galling! Moreover, for the first time SOLID Carbide pads are priced so conservatively that you can't afford not to use them. Both they and our Master Pushers are carried in stock for immediate shipment. Why put up with the difficulties caused by most ordinary pusher pads any longer? Change to Benco Solid Carbide Pads today!

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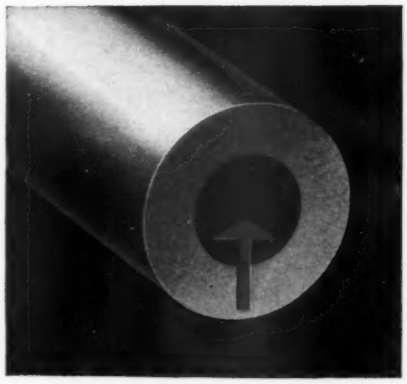
a hole here is a hindrance...



a hole here is a help

Crucible Hollow Tool Steel sections, cut to length, save you time and money when you make ring-shaped, or tubular parts, or tools with a center hole. Because these tool steel sections are already drilled through when you get them, you don't have to bore, drill, cut-off or rough-face. Production time goes down, and most scrap losses are eliminated.

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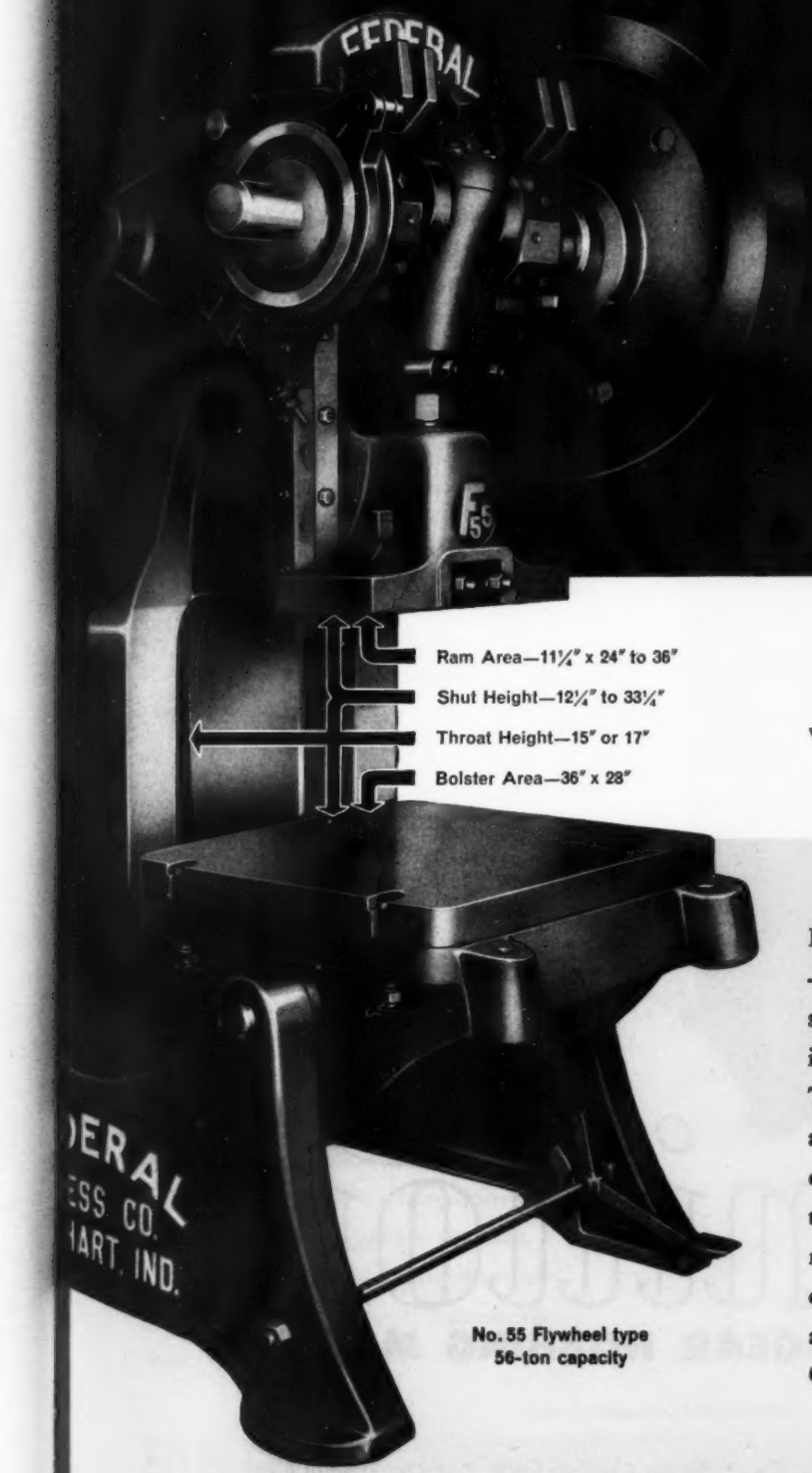

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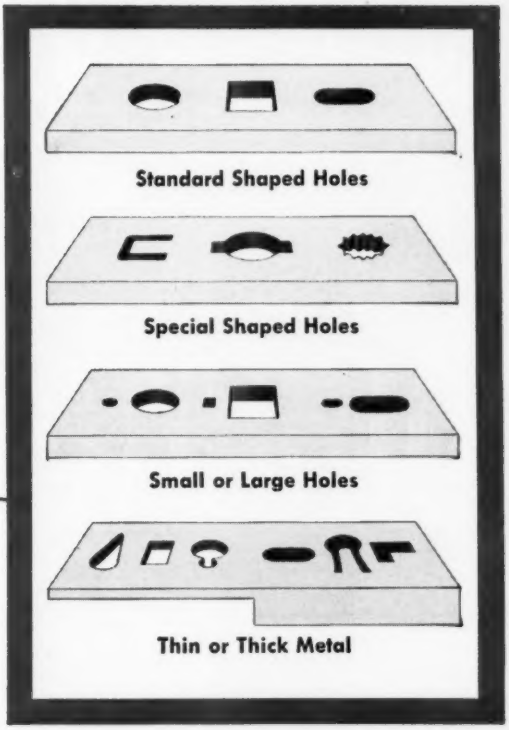

What are your piercing or forming requirements—standard or unusual shapes—small or large holes—steel or special alloys—thin or thick metals? Many hole-making applications, formerly requiring drilling or some other costly means, can now be done with R-B interchangeable punches. If you have thought your piercing jobs too tough for interchangeable punches, it will pay you to investigate the wide application potential of R-B standardized equipment.

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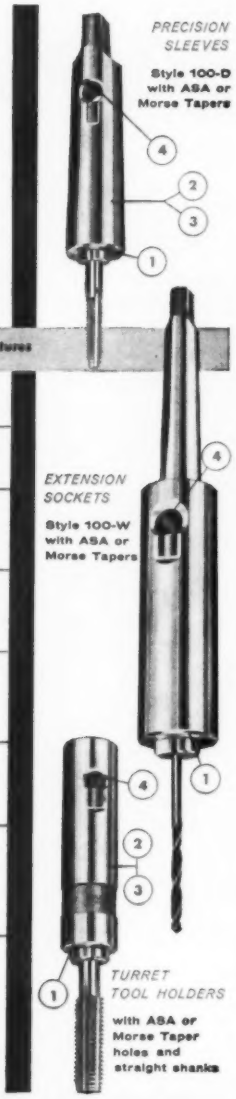
INCREASED ACCURACY	Run true in the machine spindle	1- Precision-finished to high degree of concentricity.
		2- Hardened surfaces resist nicking and burring.
INCREASED PRODUCTION	Faster tool changes	3- Properly hardened and precision-ground surfaces assure perfect fit in spindle.
	Speed against cutting tool breakage	4- New "keyhole-type" drift slot simplifies ejection of chucks and tools—eliminates pounding.
	Longer tool life	5- Outlast several soft sleeves or sockets—proper steel and hardness prevent twisting, nicking, and spindle damage.
REDUCED TOOL COSTS	Adapt your present machines and cutting tools for wide range of operations	6- Convert any Morse Taper hole and shank to a smaller or larger taper.
		7- Three series of sockets and turret tool holders extend spindles and turrets to reach otherwise inaccessible machining locations.


PRECISION SLEEVES
Style 100-D with ASA or Morse Tapers
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TURRET TOOL HOLDERS
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"Precision Holding" for holding precision

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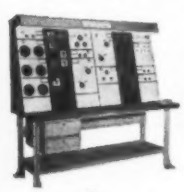
For profit-minded tool buyers!



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Take the human element out of multiple-spindle operations, help control quality and production.

NEW TENSION AND COMPRESSION TAP HOLDERS
Lock-and-eject chuck speeds tool changes, increases holding power.

HEAVY-DUTY TAP DRIVERS
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Reduce setup time, downtime, and inspection time by as much as 50 per cent.

TURRET TOOL HOLDERS
Hardened and precision ground to resist nicking and wear, assure accurate tool alignment.

CLOSE CENTER TAP DRIVERS
New design with four-slot chuck increases resistance to pull-out, keeps taps running true.

CIRCLE INFORM-A-GRAM KEY NO. 12

Presenting . . . Representing . . .

The Swind Machinery Co. has become exclusive agent for The Cleveland Punch and Shear Works Co., manufacturer of power presses, fabricating tools, punching tools, and dies. The firm will cover the territory of eastern Pennsylvania, southern New Jersey, Delaware, Maryland, and the District of Columbia.

•

Taft-Peirce Mfg. Co. has named Southern Tool Distributing Co., Atlanta, Ga., as its sales representative. Southern Tool will handle Taft-Peirce instrument gages, fixed gages, magnetic chucks, and toolroom equipment throughout Georgia and northern Florida.

•

The Satterlee Co. of Minneapolis has become a distributor for Niagara Machine & Tool Works in Minnesota and northwestern Wisconsin. The company will handle the entire line of Niagara presses, press brakes, shears, and related machines and tools.

•

The Weldrod Department of Ampco Metal, Inc. has announced the appointment of Oxygen Service Co., Kingsport, Tenn., as stocking distributor for Ampco Bronze Weldrod products.

•

The exclusive distributor in the United States and Canada for Albrecht keyless drill chucks is The Jacobs Mfg. Co. of West Hartford, Conn.

•

Two new sales representatives have been named by Size Control Co. Production Tool and Gage Co. of Rochester, N. Y., will cover New York and Alan Korest of Grand Rapids, will serve western Michigan.

•

Crotts & Saunders Engineering, Inc., Winston-Salem, N. C., has become a representative for The Sheffield Corp. The firm will sell and service the complete line of Sheffield machine tools and gages, with the exception of the Micronaire fiber fineness tester, in North and South Carolina and parts of Virginia.

•

Pearse-Dengel Tool Co., Hasbrouck Heights, N. J., is serving as distributor in the metropolitan New York area for the instrument division of Engis Equipment Co. Pearse-Dengel will carry the company's optical, electronic, and mechanical gages; and instruments and accessories for optical tooling, surface finish, and roundness testing.

AVOID the
HIGH COST
and difficulty
of fabricating
long, hard
& straight parts
by conventional
methods . . .

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hardened and ground

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The special techniques and equipment that have been developed enable high production rates and low handling costs. This permits big savings over conventional methods which are plagued with erratic warpage, straightening and resultant grinding problems. Finished *60 Case* parts frequently cost less than the scrap losses that result from conventional methods.

60 Case material has a surface hardness close to 60 on the Rockwell C scale which is essential to resist wear.

Long lengths of material ranging in diameter from ¼" to 4" are stocked to enable prompt shipment of *60 Case* parts, with or without special machining.

Write for literature and name of your local representative.

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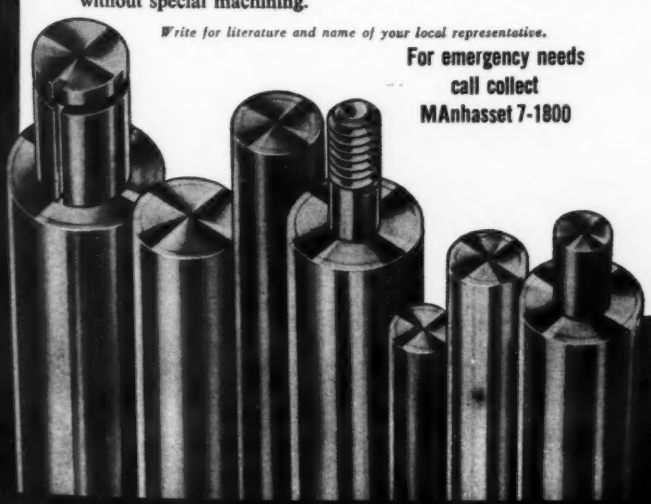

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- DELIVERY FROM STOCK
- ADDED STRENGTH
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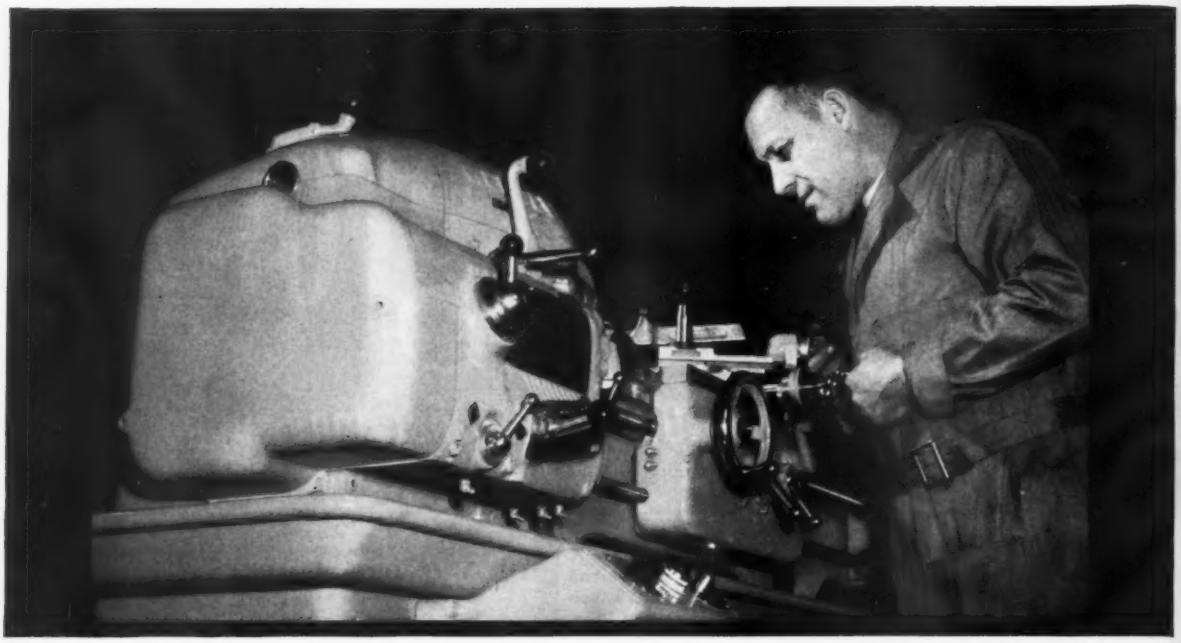
top value per dollar

with a Hendey 9" Lathe

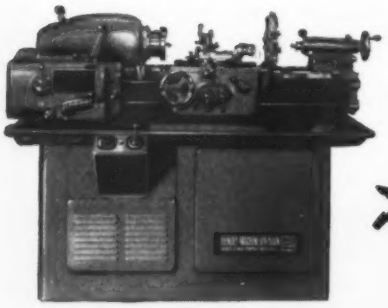
efficient operation on precision, high-speed lathe



Looking for a high-precision lathe with speeds that take advantage of carbide tooling? If you are — take a good look at the Hendey 9-in. x 24-in. tool and gage-makers' lathe. Compare it with any other lathe in its class on moderate-run production jobs, as well as on the toolroom operations where its reputation was made.

Maximum operator convenience is assured by compact control grouping. Carriage, slide, and compound combine precision with rigidity in machine's construction.

Spindle speed — infinitely adjustable from 15 to 3000 rpm — may be changed smoothly and easily while under load. Rapid stopping of the spindle, even while operating at maximum speed, means shorter floor-to-floor times since there is no waiting for machine to coast to a stop. Efficiency can be improved further on many production turning jobs by using optional accessories like the four-way tool block and taper attachment. Ask your nearby Hendey dealer about the complete facts and features.



for precision with production buy Hendey

Hendey **machine division**

BARBER-COLMAN COMPANY

87 Loomis St., Rockford, Illinois

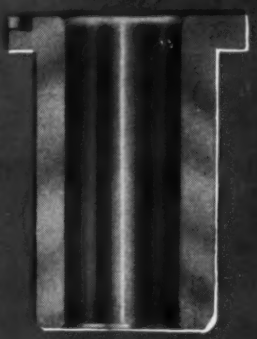
BARBER COLMAN

CIRCLE INFORM-A-GRAM KEY NO. 14

for accuracy in your production
it pays to specify

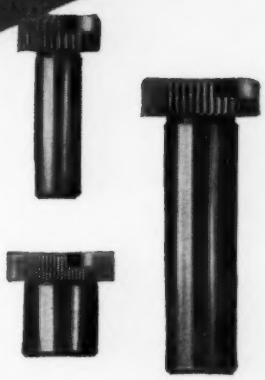
UNIVERSAL DRILL BUSHINGS

In Universal you get the best. Machined from finest quality steel. Blended radius on the top-inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip.



superfinish bores lengthen tool life

The superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum—especially in close tolerance work.



Standard sizes and lengths in stock for immediate delivery. Contact the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

Write for your copy of our new 98 page catalog describing Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, Universal Index Plungers and other Universal products.

UNIVERSAL ENGINEERING COMPANY | FRANKENMUTH 8, MICHIGAN

*Pioneered by Covel and first introduced at the 1947 Machine Tool Show. Available on all Covel surface grinders.

Save Re-scraping...Save Money! with COVEL HARD CHROME TABLE WAYS*

COVEL No. 10 SURFACE GRINDER

6"x18" Hand or Power Feed

Engineered to give you the most accurate gage, form tool and surface grinding performance at *low initial cost*. Smooth timing belt drive, hardened and ground lead screws and rigid vertical slide insure precision operation.

Hard Chrome Table Ways Reduce Maintenance Costs

This Covel introduced feature preserves the built-in accuracy of hand-scraped ways for extra years of precision service.

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

Write for FREE BULLETIN

For all the facts about the rugged low cost Covel No. 10 write DEPT. TP-87

THE MOST COMPLETE LINE OF SURFACE GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS • OPTICAL COMPARATORS

CIRCLE INFORM-A-GRAM KEY NO. 16

Skinner power chucking equipment makes old lathes perform

Better than New!

It's easy to convert your present lathes to Skinner power—and the savings will start at once. Automatically, you'll have high-production machines that slash your over-all machining time and costs.

Take Skinner Power Chucks, for example. Gripping and releasing are done instantly by compressed air. Hand wrenching is eliminated—work goes faster, is far less tiring. Consider what this feature alone will save you on every job!

For turning between centers, famous Skinner-distributed +GF+ Work Drivers need only an easy half-turn of the hood for fast, sure clamping. Here, too, speed means savings. Work Drivers grip out-of-round work evenly, match clamping force to cutting pressure, drive any round or smooth blanks, from 1/4" to 8 1/16".

No wonder more and more manufacturers are turning to Skinner with all their power chucking needs. Let us show you how the wide range of Skinner power chucking equipment can modernize your lathes!

Send for specifications, applications and installation instructions. Write Dept. 198.

Skinner Power Chucks and air cylinders are available in a wide range of sizes. The "Junior" power chucking unit shown here will convert most small lathes to a high-production, more economical machine. The complete unit consists of double-acting 6" cylinders, adapters, regulators, valve and 8" self-centering chuck with gripping capacity from ¼" to 6". Individual components are also available separately.

Here a manufacturer uses a +GF+ Work Driver to replace driving dogs on a Monarch Tracing Lathe. The lathe is used to make jig borer lead screws and the part must be removed at least five times for the entire operation. Think of the savings here, when hand wrenching was eliminated!

Skinner Power Chucks and +GF+ Work Drivers are available through leading Industrial Distributors everywhere.

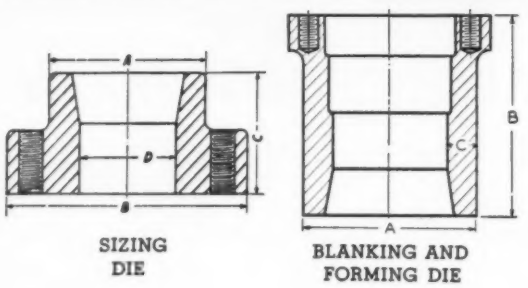
SKINNER CHUCKS

THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

SPEED PRODUCTION, CUT WASTE WHEN MAKING RING-SHAPED TOOL STEEL PARTS



New Graph-Mo® Hollow-Bar eliminates drilling, machines 30% faster

IF you make ring-shaped tool steel parts, you'll find that you can speed production, cut waste, and save steel by using Graph-Mo® Hollow-Bar. That's because Graph-Mo Hollow-Bar comes with the hole already in it. There's no drilling. You start with finish boring.

And with Graph-Mo Hollow-Bar you get the combination of proved advantages that have made Graph-Mo one of the most popular tool steels: excellent machinability, exceptional wearability, unsurpassed stability.

Actual tests prove that Graph-Mo machines 30% faster than other tool steels. That's because Graph-Mo has free graphite in its structure. And this free graphite gives Graph-Mo less tendency to pick up, scuff, and gall.

Graph-Mo's amazing wear resistance stems from a combination of graphite and diamond-hard carbides. Reports from users indicate that Graph-Mo outwears other tool steels on an average of three to one.

Graph-Mo also is the most stable tool steel ever made. A master plug gage made from this steel showed less than ten millionths of an inch dimensional change after 12 years in use. And Graph-Mo responds uniformly to heat treatment, too.

Makers of ring-shaped tool steel parts may obtain Graph-Mo Hollow-Bar in sizes from 4 to 16 inches O.D. with various wall thicknesses.

To learn more about Graph-Mo Hollow-Bar, and its application to your problems, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* STEEL

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

CIRCLE INFORM-A-GRAM KEY NO. 18

EDLUND

Edlund 2F Drilling Machine in use at Pratt & Whitney Co. West Hartford, Conn., drilling, reaming and tapping precision parts.

Edlund Model 2F Drilling Machines at

PRATT & WHITNEY

Pratt & Whitney, famous manufacturer of machine tools — Jig Borers, Keller Machines, Gages and Cutting Tools, uses Edlund Drilling Machines to assist in the production of precision parts.

Modern features —
Flexibility of infinitely variable speeds • Rugged construction for sustained accuracy typical of Edlund; • No Loss of Production Time Changing Belts or Gears.

For complete information and specifications about Edlund Model 2F Drilling Machines for your jobs, write for Bulletin 140R.

Production Line of
Edlund 2F Drilling Machines
at Pratt & Whitney featuring—

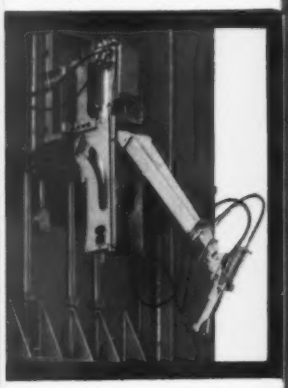
- Power Table Lift
- Extra Spindle Travel
- Reversing Motor Tapper

EDLUND REPRESENTATIVES IN MAJOR CITIES

EDLUND
MACHINERY COMPANY
Cortland, New York
Division of Harsco Corporation

see how mighty Niagara Presses

IRON HAND removes finished stampings from the press, ***automatically.***



BRAIN CENTER OF THE AUTOMATION SYSTEM, the Rotary Limit Switch can be adjusted precisely while the press is in motion to synchronize automation mechanical devices with the press cycle.

Niagara SE2-300-84-60
Straight Side Eccentric Geared Press
Equipped for Automation

ses are automated for peak productivity

Engineered to excel in large, heavy tonnage drawing, punching and blanking work, Niagara Straight Side Eccentric Geared Presses are readily outfitted with the most advanced automation controls and devices. Net result: Streamlined production, greater safety and simplified operation.

Take a look at the modern, enclosed construction of this rugged Niagara Two-Point Eccentric Geared Press. See how today's most advanced automation controls and devices are furnished as integral, built-in components of the press itself . . . *with piping and wiring fully concealed.* Note, too, how the driving assembly is neatly housed within the crown. Nothing has been overlooked in making this press an outstanding engineering triumph.

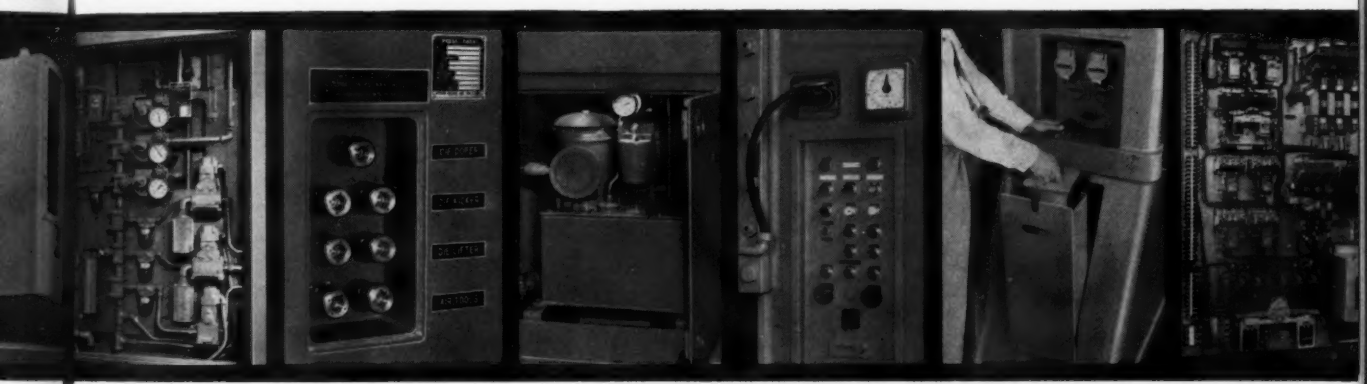
Niagara's eccentric drive delivers greater torque with less deflection. Rigid, all-steel, four-piece, tie rod frame provides utmost accuracy and prolonged die life. Niagara's low inertia, pneumatic friction clutch runs cooler and outlives others, for most of its weight continues to rotate with the flywheel to reduce heat and wear.

MAKE SURE THAT YOU HAVE ALL OF THE FACTS on Niagara Straight Side Eccentric Geared Presses . . . the one point, two point and four point designs in capacities from 100 - 1000 tons . . . and how they can be equipped for automation. Write for illustrated Bulletin 66 today.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N.Y.

DISTRICT OFFICES: Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U. S. cities and major foreign countries



AIR CONTROL PANEL (Above left) conceals and protects air line pressure switches, lubricators, filters, gauges and valves behind dust-tight doors within one of the uprights.

CONTROLLED AIR SUPPLY RECEPTACLES (Above right) are provided for die doper, die kicker and die lifter, all synchronized with press cycle. Auxiliary receptacles are for die maintenance tools.

AUTOMATIC CIRCULATING OIL SYSTEM (Above left) sends metered flow of clean, filtered oil to all bearings and gears in the crown, as well as to slide gibs. Correct operating oil pressure is maintained or press stops automatically.

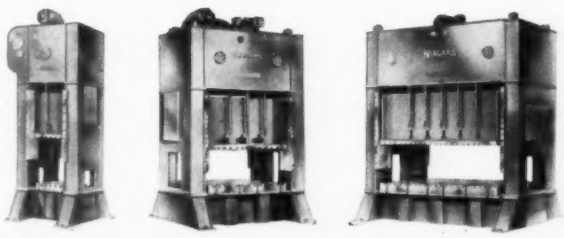
OPERATOR'S PANEL (Above right) features de-luxe operating controls conveniently arranged for fingertip direction of every press motion. Note receptacle for "RUN" push button station and Selsyn stroke position indicator.

AUX. POWER SUPPLY & SAFETY BLOCK. (Above left) Two 110 V. and two 440 V. receptacles for automation equipment, conveyors, tools, etc. Safety block (stored in bin) is chained to safety plug which de-energizes press control when pulled from receptacle.

COMB. MOTOR & PRESS CONTROL (Above right) in oil and dust-tight enclosure flush mounted in frame.

ONE-POINT, TWO-POINT AND FOUR-POINT SUSPENSION

(100 through 1000 ton capacities)



NIAGARA

straight side ECCENTRIC GEARED presses

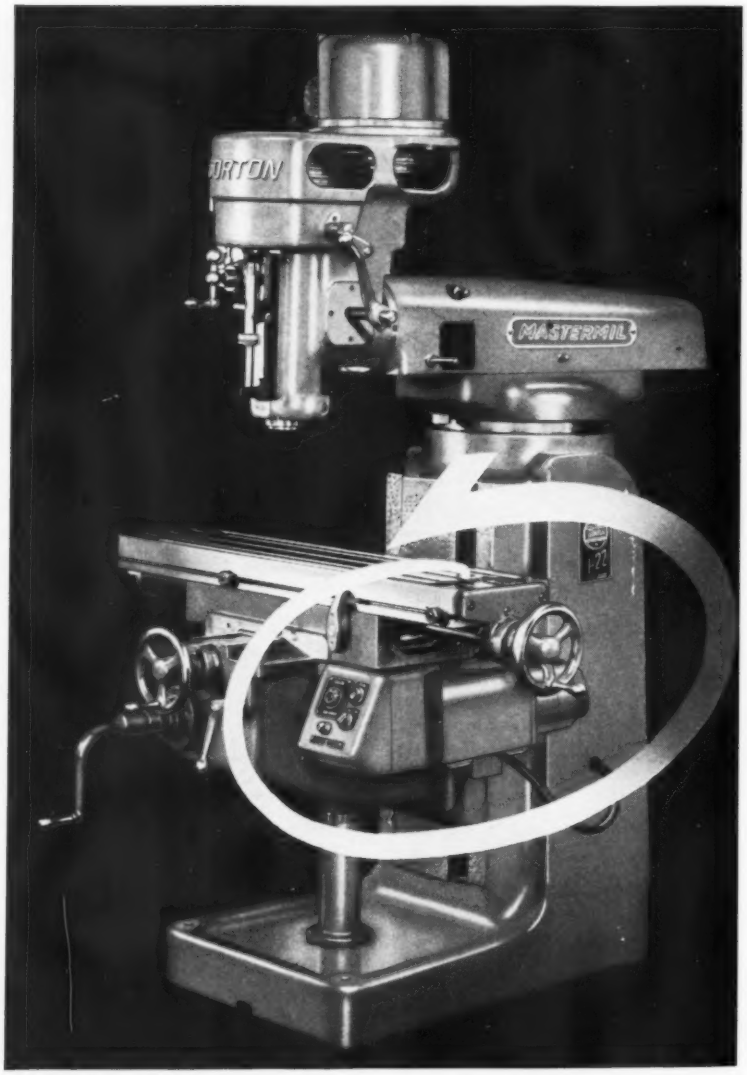
America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

For the first time — on any milling machine

ELECTRONIC DYNA-DRIVE

REGISTERED TRADE MARK

THE "TORQUE-THINKING" TABLE FEED



Yours *EXCLUSIVELY* with

GORTON MASTERMIL

It "feels"... as it feeds

• The exclusive Gorton Dyna-Drive® Table Feed unit "thinks while it works." It automatically adjusts to provide the exact amount of torque required. This electronic "brain" compensates during the cutting operation for small variation in density, hardness and molecular structure of the material being machined. Results are exceptionally fine finish and prolonged cutter life.

The Gorton Mastermil is precision-built throughout, simple, rugged with the finest milling head of any machine in its class. Ram adjusts in and out. Turret revolves and spindle swivels 90° left or right.

Learn more about this remarkable machine by writing for bulletin 2699-A
1208

GORTON

GEORGE *GORTON* MACHINE CO.

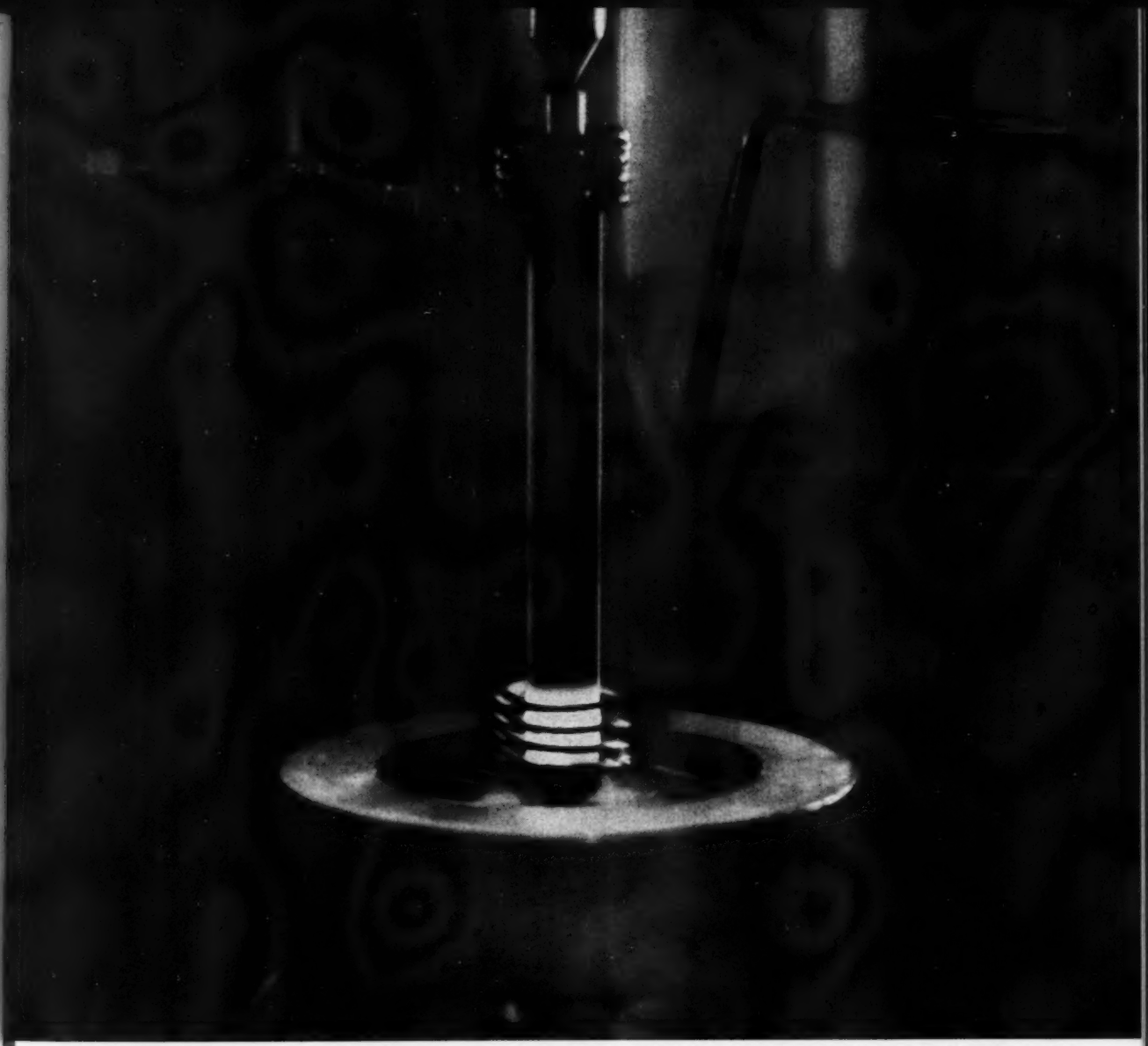
1208 RACINE STREET • RACINE, WISCONSIN

SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A7-1003-1P

CIRCLE INFORM-A-GRAM KEY NO. 22



Ketos shaft being induction hardened to Rockwell 55-56, while ends remain soft for final machining. Photographed at Control Instrument Co., Inc., Brooklyn, N. Y.

KETOS has wide hardening range with minimum volume change...

Ketos is a low priced alloy tool steel that can be hardened from low temperatures with practically no volume change. It has deep hardening qualities, and a fine grained structure, that make it desirable for many production parts.

That's why nondeforming Ketos is well suited not only for most tool steel applications such as gauges, dies, and taps but also for close-tolerance, wear-resistant parts like the actuator bar shown in the induction heating unit above. The thin contact edges of this particular part withstood a "life test" of over 4-million high speed blows. No other steel tested lasted more than 1-million cycles before it chipped and failed.

If Ketos sounds like the steel you should be using, call your nearby Crucible warehouse. Stocks of Ketos and dozens of other special tool steels are large, delivery fast. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 23

Reduces Machining Time

with

BULLARD

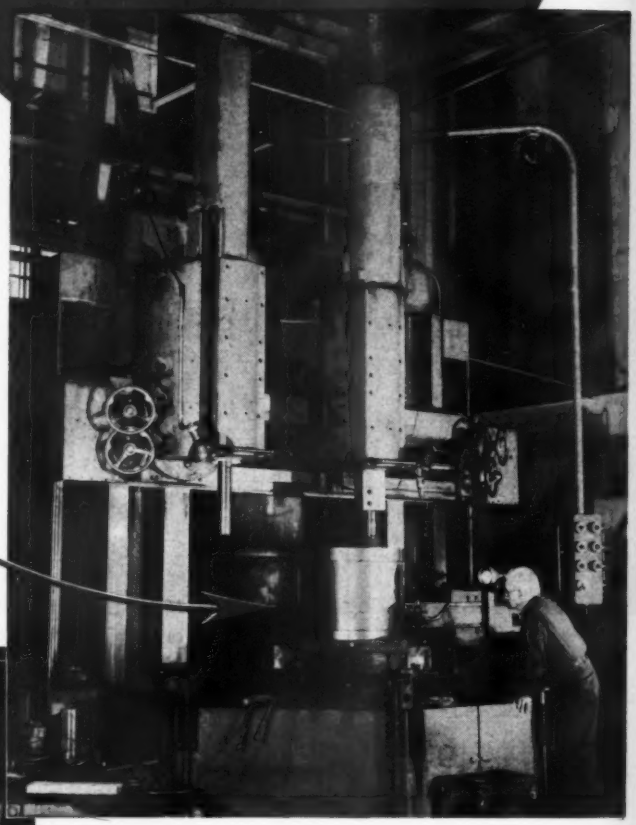
35% OVER EARLIER MODEL

Cut Master

VERTICAL TURRET LATHE

MODEL 75

In the machining of a barrel housing used in a large mechanical press, manufactured by the Clearing Machine Co., Chicago, Ill., Mr. L. W. Prochnow, Factory Manager says "our 66" Cut Master, Model 75 is a big, husky machine. Its heavier rams, overall rugged construction and greater horsepower provide higher speeds and feeds easily controlled from the movable Pendant. These features enable us to cut our floor to floor time, per piece, by four hours. And we've had no maintenance problems in nearly two years of operation." These same cost savings can be applied to your machining problems when considering replacement or additional capacity in your plant.



From rough casting, weighing 1,780 lbs., 28" in diameter and 36" long, to finished piece with a 35% saving in machining time.

to cut costs
when cutting metals—
buy BULLARD

Our nearest Sales Office or Distributor will be glad to show you how or write for complete catalog to

THE BULLARD COMPANY
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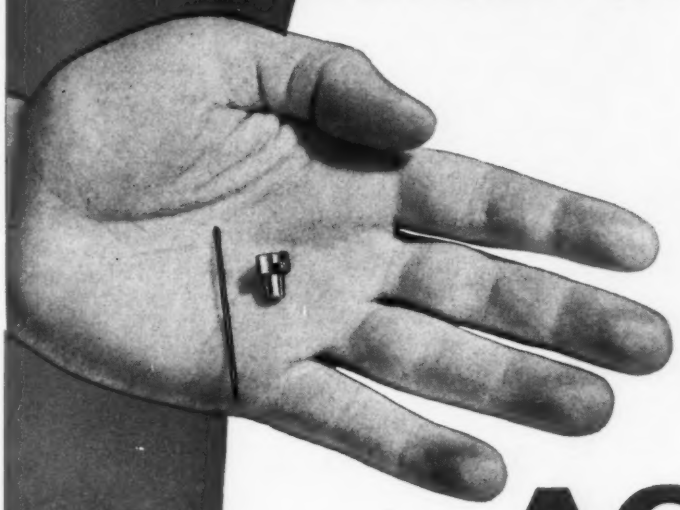
CIRCLE INFORM-A-GRAM KEY NO. 24

TOO SMALL FOR A NEEDLE...



Just Right for a #80 Drill!

ACME
MICRO DRILL JIG BUSHINGS

Only ACME Offers You TWO Standards:
A.S.A. and ACME - #80 to 1/16"

- STANDARD micro sizes from your local distributor's stock— *special sizes on request.*
- Standard catalog tolerances
- Full drill bearing on standards
- FREE catalog and price list

Write for information and prices on micro, standard and tungsten carbide drill jig bushings, dowel pins, and hardened and ground parts and assemblies to order.

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CIRCLE INFORM-A-GRAM KEY NO. 25

Precision by the Truckload - - they're Blanchard ground!

This truck is loaded with 14 tons of steel. Its cargo is 33 soft steel plates, each measuring 27½" x 25½" x 11.125", and ground to ± .001" on a Blanchard Surface Grinder.

Dies up to 84" across corners, can be ground on a Blanchard at great savings. Grinding can be controlled without guesswork—leaving a flat, sharp die—as soon as the entire surface is cleaned up. Die resharpening on the Blanchard allows you to get maximum life from your valuable dies and end plates.

Ask for details on the 15 standard Blanchard models.

For best results in surface grinding . . .

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS.

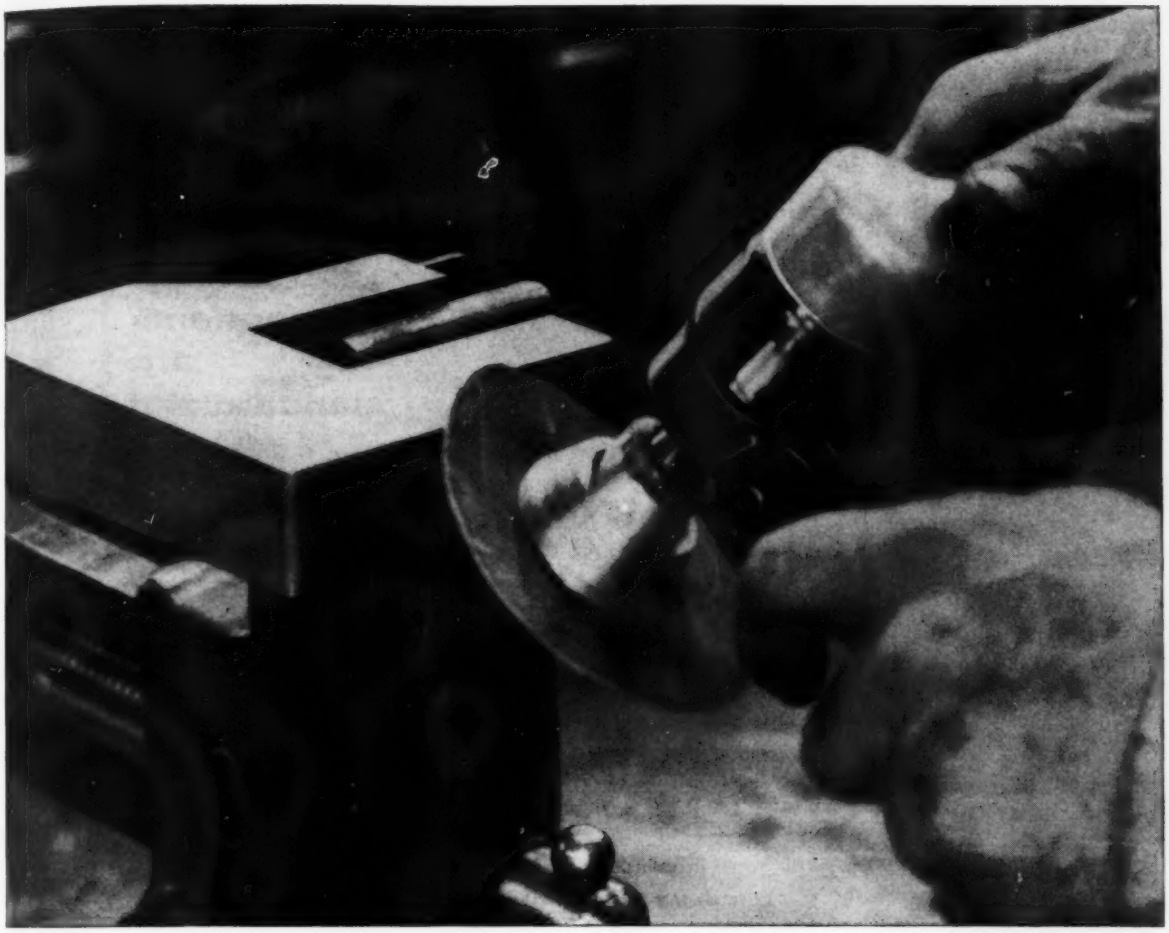
THE BLANCHARD MACHINE CO., 64 State St., Cambridge 39, Mass.

Gentlemen: Please send me a free copy of "The Art of Blanchard Surface Grinding" (3rd edition) and "Work Done on the Blanchard" (5th edition)

NAME_____ STREET_____

FIRM_____ CITY_____ ZONE____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 26



Finishes dies 20% faster... also eliminates abrasive costs

JOB: Putting smooth radius on corners of dies. Formerly used small wheel grinder. Rotor Application Engineer recommended the *right tool*—a Rotor B-02PT 20,000 rpm Disc Sander.

RESULTS: Cut operating time 20%. Light Rotor B-02PT is easier to handle. Gives better finish. Time savings paid for Rotor B-02PT in 12 weeks. Uses 3″ discs, cut down from used 7″ and 9″ discs—a bonus saving of $17.50 per week in abrasive costs.

Why not have a Rotor Application Engineer demonstrate this speedy sander on *your* job. Write for a copy of specifications and Bulletin 53.

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

ROTOR TOOLS®
CLEVELAND, OHIO

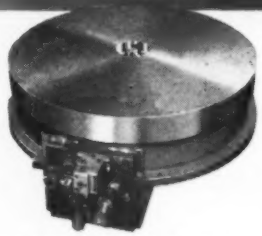
CIRCLE INFORM-A-GRAM KEY NO. 27

THIRTEEN STATION AUTOMATIC TRANSFER MACHINE

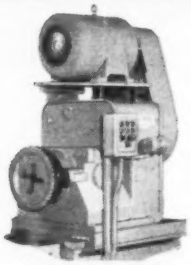
— mills, drills, reams, spotfaces, taps and saws apart cast iron bearing cap blocks. Machine includes 5 standard feed slides, 9 standard production units.

Because major components are standardized

KEARNEY & TRECKER TAKES THE "SPECIAL COSTS" OUT OF PRODUCTION MACHINE TOOLS



STANDARD ROTARY INDEX TABLE available in 4 different table diameters, any practical number of indexes.



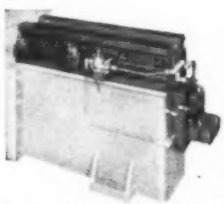
STANDARD MILLING HEAD UNIT 4 sizes. Single spindle . . . various horsepower and speed ranges . . . single or double reduction drive . . . automatic quill retraction. Any size can be modified for boring.

Here's a sound, proven *economical* approach to your production machine tool problems . . . Kearney & Trecker production machine tools featuring standardized components.

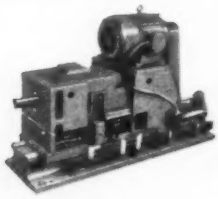
You get IMPORTANT SAVINGS—benefit directly three ways: (1) lower initial cost; (2) less lead time needed and (3) proven standard units mean efficiency *plus* simplified machine maintenance.

Ask the Kearney & Trecker man—he'll show you more examples of standardized machine components in production machine tools — the keys to capturing more profits from production!

Kearney & Trecker Corp.
6776 W. National Avenue, Milwaukee 14, Wis.



STANDARD FEED SLIDE UNIT provides hydraulic feed for milling, boring or drilling heads. Available in 4 sizes and in various length cylinder strokes.



STANDARD WAY TYPE DRILL UNIT for drilling, boring, reaming, counter-boring and chamfering. Single and multiple spindle arrangements, single or double feed rates.

ASK FOR FREE KEARNEY & TRECKER Production Machine Tools Bulletin SMD-57. It provides full standard component details — and their application to production machine tools.

STANDARD QUILL FEED UNIT for drilling, boring, reaming, spotfacing, counter-boring and chamfering. Single or multiple spindle arrangements — single or double feed rates.

KEARNEY & TRECKER MILWAUKEE

Designers and Builders of Precision and Production Machine Tools Since 1898

CIRCLE INFORM-A-GRAM KEY NO. 28

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Kearney & Trecker Corp.
6784 W. National Ave.

ROCHESTER 4, N. Y.
Syracuse Supply Co.
311 Alexander Street

ST. LOUIS, MO.
Blackman & Nuetzel Machinery Co.
3713 Washington Ave.

ST. PAUL, MINN.
Sales Serv. Mach. Tool Co.
2363 University Ave.

SALT LAKE CITY, UTAH
Todd Machinery Co.
4165 Holloway Drive

SAN FRANCISCO, CAL.
Moore Machinery Co.
7th & Carleton-Berkeley

SAN JOSE, CALIF.
Moore Machinery Co.
656 Stockton Ave.

SEATTLE, WASH.
Dawson Mach. Co.
5700 First Ave., S.

SHREVEPORT, LA.
Peerless Supply Co., Inc.
701 Spring St.

SYRACUSE 1, N. Y.
Syracuse Supply Co.
314-332 W. Fayette St.

TULSA, OKLA.
White Star Mach. Co.
104 Boulder Bldg.
19 West 10th Street

WICHITA, KAN.
White Star Mach. Co.
301 N. St. Francis

CANADA
MONTREAL
OTTAWA
QUEBEC
TORONTO
WINDSOR
Williams & Wilson Ltd.

KEARNEY & TRECKER MILWAUKEE

CIRCLE INFORM-A-GRAM KEY NO. 28

At Your SERVICE

Practical assistance in plant and architectural engineering and construction management is given by Lester B. Knight & Associates, Inc., consulting engineers, of Chicago. The organization aids in auditing operations, defining management functions, modernizing methods and facilities, and designing complete new plants.

◆

Complete magnesium fabricating facilities are offered by The Dow Chemical Co., Midland, Mich. The company's Bay City plant handles magnesium fabricating work from prototype through production, including engineering. Magnesium enables a manufacturer to save weight, add strength, and cut costs.

◆

Portland Copper & Tank Works, Inc. of South Portland, Me., makes available operations and services for the fabrication of stainless steel and high temperature alloys. The company works with all grades of stainless, aluminum, Inconel X, Haynes Alloy No. 25, Multimet, titanium, Timken, and A286. The unusual quality control program has resulted in an almost zero rejection rate on jet engine "hot" parts fabricated for the Air Force. In addition, the firm's engineering development and production departments offer extra service to civilian customers.

◆

Fabricated alloy steel items are made by Aluminum & Architectural Metals Co., Heat Treating & Industrial Processing Div'n, of Detroit to customer's drawings and specifications for heat treating operations and industrial processing. The company specializes in hard-to-make fabrications such as those of stainless steel in all alloys, aluminum, bronze, brass, and carbon steel. It has developed improved designs of metal fabrications, which provide many more hours of service, reducing costs.

◆

Engineering development and manufacturing in the specialized field of bearings and lubrication is provided by Continental Bearing Research Corp. of New York. The company analyzes, designs, and supplies bearings, in production or semi-production quantities, for specific applications, such as bearings that operate with low viscosity lubricants in water pumps and gas turbines. Design studies also are undertaken on project or consulting basis.

HOLD IT!

FIRMLY BUT GENTLY

WITH WOODWORTH CHUCKING EQUIPMENT

Our tough looking character who is holding the little bird clearly demonstrates one fact whenever you are holding anything it should be secured with gentle firmness. And this is so true when considering chucking equipment.

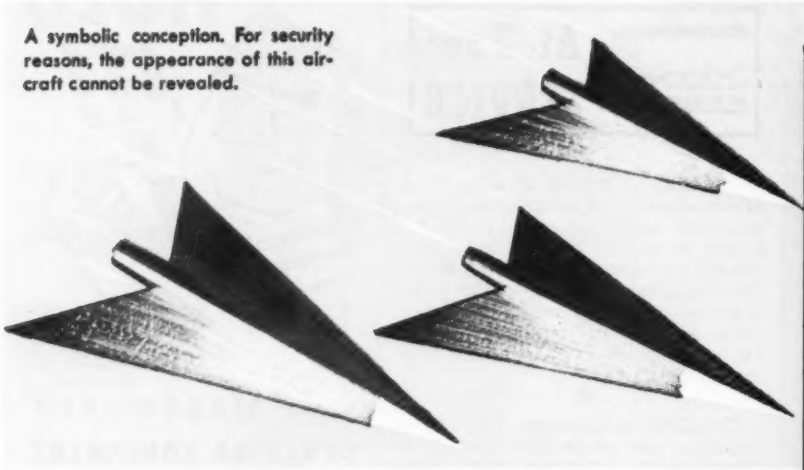
Your best machine will produce only as accurately as its work-holding device permits and Woodworth manufactures the most rugged, accurate and dependable chucks for precision machining in America.

We invite your inspection and consideration of N. A. Woodworth products. There is a Woodworth Sales Representative in your area and a letter to the N. A. Woodworth Company will place him promptly at your service.

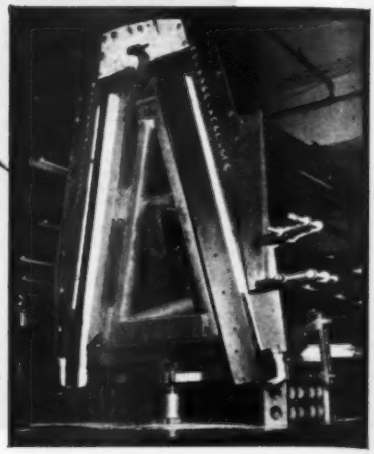
"Accuracy you can trust"

WOODWORTH
1300 East Nine Mile Road
Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 29



A symbolic conception. For security reasons, the appearance of this aircraft cannot be revealed.



A master drill and setting gauge, showing use of Epon resins to duplicate compound curves and contours.

In building the supersonic Arrow . . .

Avro Aircraft, Limited saves time and money with

EPON® RESIN

dies, tools, jigs, molds and fixtures

Avro Aircraft, Limited—developing Canada's supersonic Arrow—is achieving major savings with Epon resin tooling.

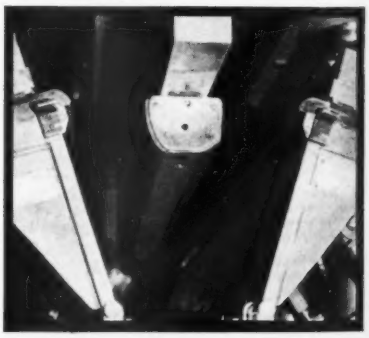
Epon resins provide faster, lower cost preparation of stretch dies, forming tools, drop hammer dies, jigs, duplicate master die molds, checking and assembly fixtures. Avro reports that in making dies of Epon rather than metal, manpower requirements are two-thirds less, which is reflected in correspondingly great savings in the unit cost of tooling.

The Epon resins have an ideal combination of properties for tooling applications. To list just a few:

- Exceptional dimensional stability, high impact strength, excellent resistance to abrasion, minimum residual stress in cured parts.
- Ease and speed of preparation.
- Low shrinkage in filled formulations, assuring perfect master reproduction; minimum warping and stresses.
- Adaptability to repairs and design changes.
- Minimum finishing requirements for smooth surfaces.

Like Avro, other leading manufacturers report savings as high as 80% with Epon resin tools and dies—for *production* as well as experimental and short-run work. Can you make comparable savings in your own operations? Find out by writing for technical literature on Epon resins for tool and die applications.

Epon-faced die requires only hand rubbing to achieve smooth finish. Radii are being touched up with sander.



Stretch die, with Epon resin facing of involved contours, ready for run on 800-ton press.

SHELL CHEMICAL CORPORATION

CHEMICAL SALES DIVISION, 380 Madison Avenue, New York 17, New York

Atlanta • Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Newark • New York • San Francisco • St. Louis

IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited • Montreal • Toronto • Vancouver

SHELL

CIRCLE INFORM-A-GRAM KEY NO. 30

Left to right: light-duty angle screw driver; light-duty angle nut setter; heavy-duty angle screw driver; heavy-duty angle nut setter.

NEW "ANGLES"

for close-quarter

screw driving and nut setting

A new line of angle attachments—that take over where straight line tools must leave off—is now available for the new line of improved Keller Tool air drivers.

Four new attachments—heavy- or light-duty angle screw drivers and nut setters—speed and simplify the *tough* job of driving fasteners in close quarters and hard-to-reach places.

Keller Tool No. 2 air motors—*with increased speed, increased power, low noise level and low maintenance*—power both the 12G-2 series screw drivers and the 16G-2 series nut setters.

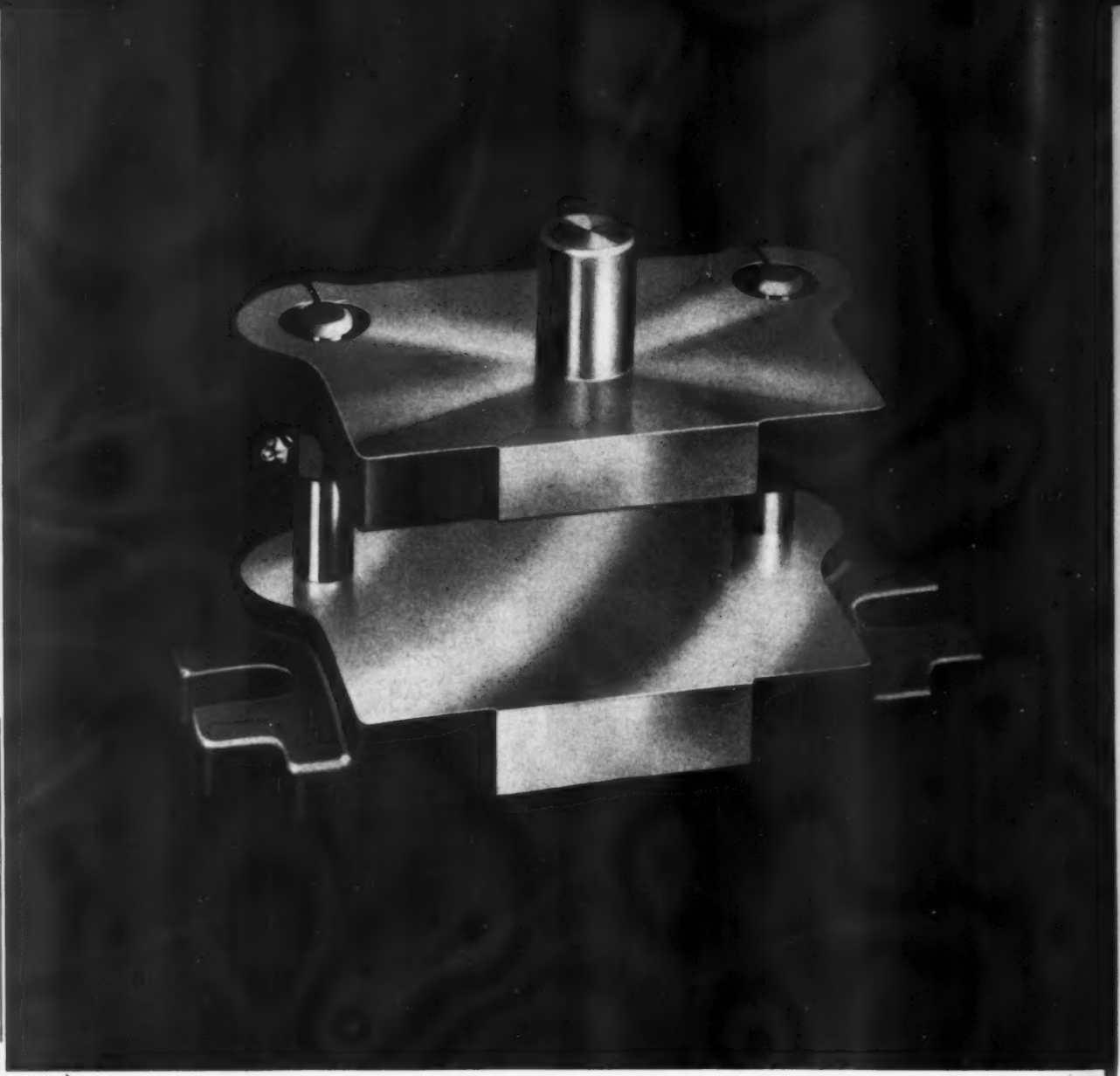
Ask your Gardner-Denver representative for a demonstration of the new Keller Tool No. 2 air drivers and their versatile attachments . . . or write for details.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 31



THIS IS RIDICULOUS...

No one but a photographer ever saw a die set as shiny-bright as this one. If it's not being worked on in the tool room, usually it's buried away in a punch press, covered with oil and dirt, banging out piece after piece day after day.

And each one of those pieces is just like the others within a few thousandths of an inch. That's precision, the secret behind the success of mass production.

That's the reason for the die set's existence—to aid in maintaining precision just as long as possible. To do that, it has to be precision built.

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

Factory-assembled and factory-inspected, Detroit die sets meet the most important requirement of a die set, precision, in their parallelism, squareness and finish. High-quality materials plus more than ample size maintain that precision.

Over 2000 standard, stock die sets are detailed in Detroit Die Set's new catalog. Details on specials and accessories, too. Ask for it on company letterhead, or call your local representative.

Detroit DIE SET CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 32

FILMS TO SEE

"Man on a Skyhook" illustrates the versatile color and texture possibilities of aluminum. Textured finishes range from simple brush effects to craggy pebble designs. The film is available on a free-loan basis from Aluminum Co. of America, Motion Picture Section, 1501 Alcoa Bldg., Pittsburgh 19.

•

A new fully automatic balancing machine is shown in operation in a 16 mm color film. The machine has been designed to handle both rubber and metal automotive parts, balancing tires, tire and wheel assemblies, and brake drums at a rate of more than 300 pcs/hr. To obtain the film, contact Micro-Poise Engineering & Sales Co., 14851 Grand River Ave., Detroit 27.

•

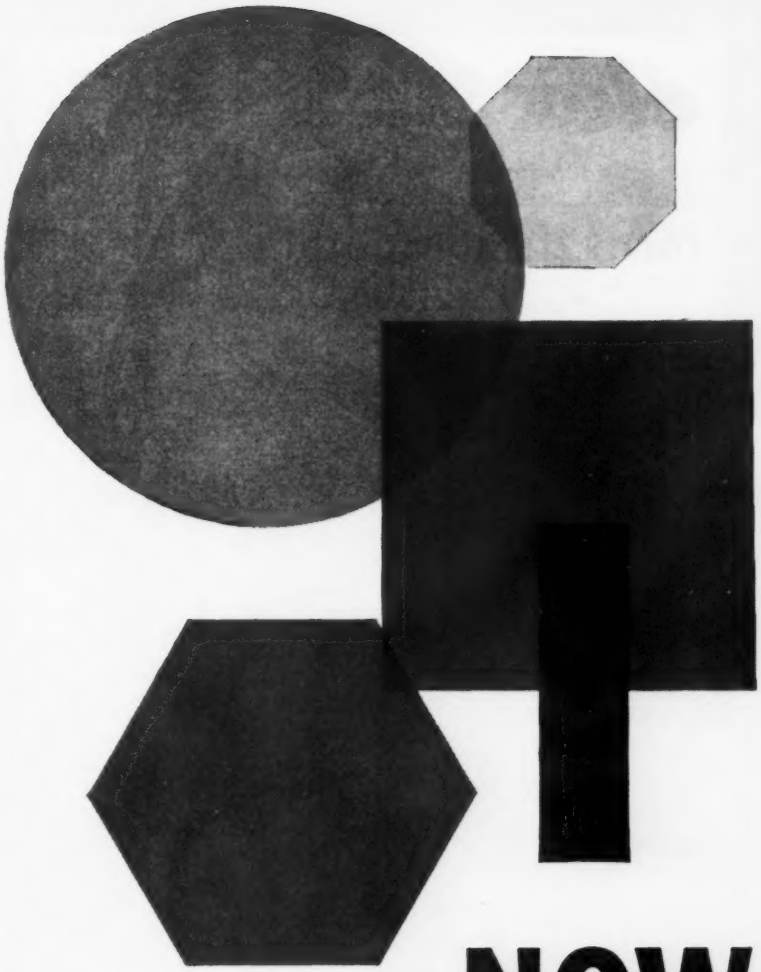
"Magnifying Time" is made up of a series of demonstration shots to show the Kodak high speed camera and its ability to aid in solving engineering research and production problems. This 16 mm sound movie is directed primarily to industrial personnel responsible for efficient plant operation. A four to six weeks advance notice is required for booking the movie, which can be obtained from Eastman Kodak Co., 343 State St., Rochester 4, N. Y.

•

Maintenance and trouble-shooting procedures for Huck hydraulic driving tools are described in a 30 min, 16 mm slide film with synchronized sound track. Detailed are the construction and operation of Model 126 hydraulic pull gun, which is used for installing Huckbolt fasteners and blind rivets. Maintenance procedures for the removal, repair, and replacement of the various working components are covered in step-by-step sequences. The slide film is made available by Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7.

•

"Speeding the Distribution of Engineering Drawings by Xerography," a 16 mm sound-color film, is now being issued by The Haloid Co., Film Distribution Dept., Rochester 3, N. Y. The film shows the use of XeroX Model 1218 copying equipment at IBM, Ford, Chrysler, and Glenn L. Martin in the xerographic reduction of outsize engineering drawings to convenient proportions. They are reproduced on offset paper masters from which multiple copies are run off. The money-saving process speeds engineering drawings and change notices to production lines and vendors.



when you need it **NOW**

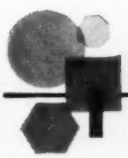
call Wheelock, Lovejoy!

For quick action — *regardless of the size of your order* — call Wheelock, Lovejoy for alloy steel bars, billets or forgings. Whatever size, shape or heat treatment you may need, you can get it *when you need it* by ordering directly from the W-L warehouse nearest you.

Expert metallurgists will help you select from our own HY-TEN steels or the standard AISI or SAE grades.

Write today to our Cambridge office for your *free* Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

Warehouse Service – Cambridge • Cleveland • Chicago Hillside, N. J. • Detroit • Buffalo • Cincinnati • *In Canada* – Sanderson-Newbould, Ltd., Montreal & Toronto.

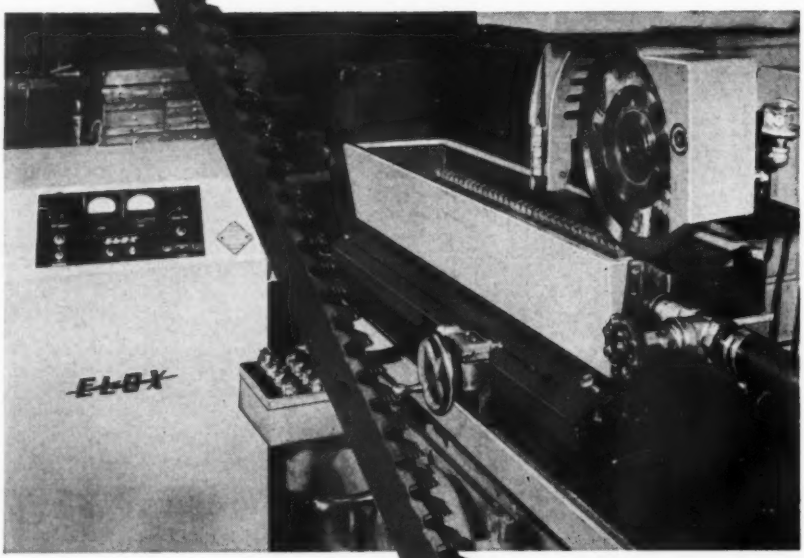


WHEELOCK, LOVEJOY & COMPANY, INC.

135 Sidney Street, Cambridge 39, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 33

"elox saves us $294
...8 operations
form grinding this broach"
Ford Motor Aircraft Division



Savings on preformed carbide blanks	$ 32.00
Omitted operations savings	120.00
Diamond wheel savings	142.00
Sums up to	$294.00

The Job...
Broach, used for broaching the pine tree form on turbine blades of the J-57 Jet engine.

NO DIAMOND WHEEL...

EDM substitutes inexpensive brass wheels costing less than $45 for expensive diamond wheels costing a minimum of $150. Brass wheels are formed for $1 as against a diamond wheel contour forming cost of $35.

NO PREFORMED CARBIDE BLANKS...

Conventional machining necessitates preformed tungsten carbide and preformed steel shanks. EDM machines the carbide, brazing material and steel simultaneously, and requires no indexing to assure a perfectly formed broach as to location and size.

OPERATIONS...

Conventionally machined, the pine tree broach requires 22 operations. EDM does it better in 14.

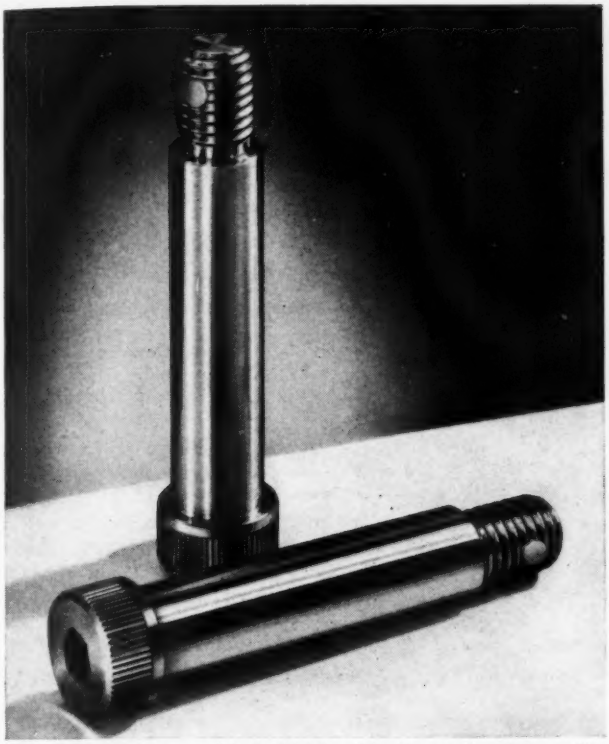
Electrical Discharge Machining has reduced the machining time of this intricate form in 32 carbide tipped teeth to a total time cycle of 33 minutes . . . one-half the time of abrasive grinding. Tolerances held to: +0, —.0002".

elox corporation of michigan *T.M. Reg.
1834 N. STEPHENSON HWY. • ROYAL OAK 3, MICHIGAN

EDM keeps you ahead of competition • Grinding • Die Sinking • Form Grinding • Single Point and Insert Tool Sharpening

CIRCLE INFORM-A-GRAM KEY NO. 34

UNBRAKO STRIPPER BOLTS NOW AVAILABLE WITH THE NYLOK* SELF-LOCKING DEVICE



UNBRAKO STRIPPER BOLTS with the Nylok self-locking device. Nylon pellet locks them with positive, dependable prevailing torque action. Bolts are reusable.

SELF-LOCKING UNBRAKO STRIPPER BOLTS fasten this stripper plate securely. Constant vibration, shock, extended running time will not cause these bolts to loosen.

Self-locking UNBRAKO stripper bolts (shoulder screws) save time, money and headaches wherever they are used. They eliminate the costly, time-consuming checking of bolts to see that they are securely tightened. They protect precision tools and dies from damage caused by vibration-loosened bolts. They assure that your equipment will have longer service life, with reduced maintenance and downtime.

UNBRAKO stripper bolts are manufactured to the highest standards of precision. They are made of heat-treated alloy steel with continuous grain flow lines and have fully formed Class 3A threads finished close to the shoulder for maximum strength and holding power. Shoulders, held to fine tolerances, are concentric with heads and threads for uniformly accurate fit. The tough, resilient, *permanent* nylon locking pellet is integral with the threaded section.

All standard UNBRAKO socket screw products are available with or without the Nylok self-locking device. Authorized industrial distributors stock them. Write us for catalog and technical data on the complete line. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

*T.M. Reg. U.S. Pat. Off.. The Nylok Corporation

UNBRAKO® SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

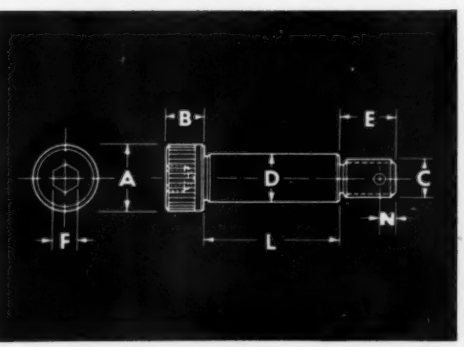
SPS

JENKINTOWN ■ PENNSYLVANIA

We also manufacture precision titanium fasteners. Write for free booklet.

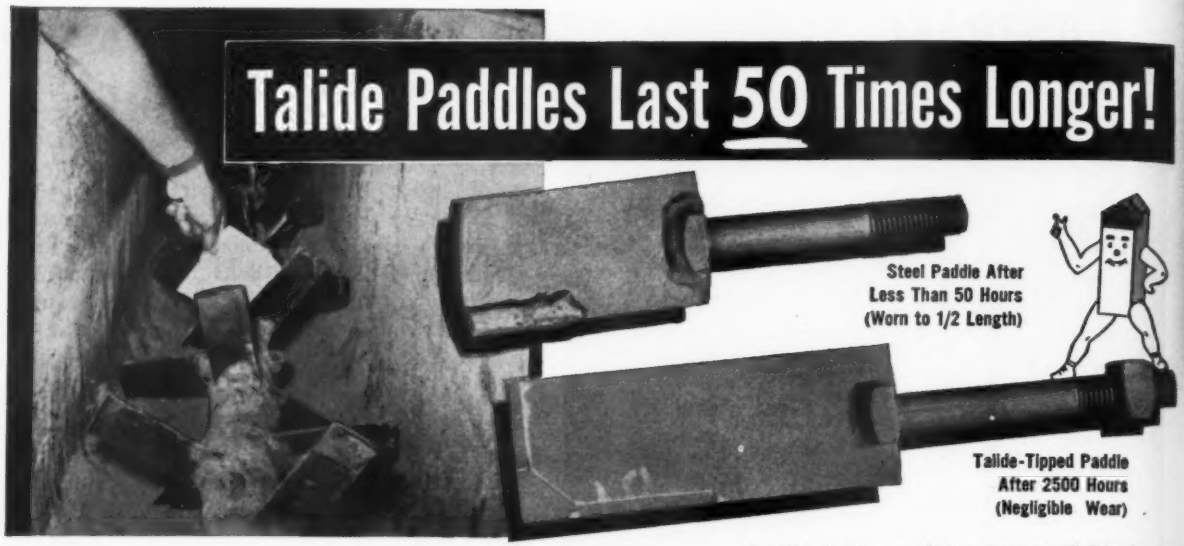
SPECIFICATION DRAWING. UNBRAKO stripper bolts are available with standard shoulder lengths ranging from ⅜ to 6 in.

D	Shoulder Diameter*	¼	5/16	⅜	½	⅝	¾
C	Thread Diameter UNC	10—24	¼—20	5/16—18	⅜—16	½—13	⅝—11
E	Thread Length	⅜	7/16	½	⅝	¾	⅞
A	Head Diameter	⅜	7/16	9/16	¾	⅞	1
B	Head Height	3/16	7/32	¼	5/16	⅜	½
F	Size of Hex. Hole	⅛	5/32	3/16	¼	5/16	⅜
N	Pellet Location	.141	.172	.187	.203	.234	.281
	*Shoulder Diameter Tolerances Max.	.249	.3115	.374	.499	.624	.749
	*Shoulder Diameter Tolerances Min.	.248	.3105	.373	.498	.623	.748



CIRCLE INFORM-A-GRAM KEY NO. 35

Talide Paddles Last 50 Times Longer!



HARDEST MAN-MADE METAL!

TALIDE METAL, a tungsten carbide of superior quality, is harder, stronger, and more resistant to abrasion than any other metal. Properly applied, it gives superior service on applications where wear, heat, strain, and shock are destructive to other metals.

- **ABRASION RESISTANCE**— Up to 100 times that of steel.
- **COMPRESSIVE STRENGTH**— Higher than all melted, cast or forged metals and alloys.
- **RESISTANCE TO DEFORMATION**— 2 to 3 times greater than steel.
- **HEAT RESISTANCE**— Resists oxidation and thermal shock up to 1500° F.
- **THERMAL EXPANSION**— Less than half the rate of steel, "creep" is negligible.
- **FRICTIONAL RESISTANCE**— Lower than steel, non-galling, "slippery" properties higher.

ALL TALIDE METAL grades are made in latest type vacuum electric furnaces by precision methods under rigid control. A wide variety of shapes and sizes can be supplied—up to 25" in diameter, 100" in length, and 5000 pounds by weight. Parts can be supplied to any grit finish required down to one micro-inch. The physical properties of the most commonly used grades are listed below. Other grades are available for specialized applications.

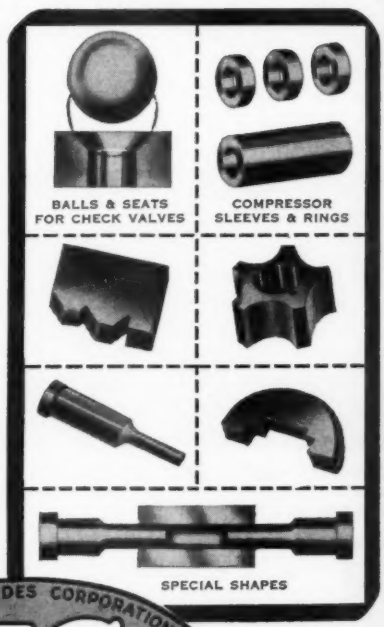
PHYSICAL PROPERTIES OF TALIDE METAL (P. S. I.)

Application	Operation	Talide Grade	Rockwell "A" Hardness	Specific Gravity (Density)	Transverse Rupture Strength	Compressive Strength	Co-Efficient of Thermal Expansion	Modulus of Elasticity (Deflection)
WEAR SURFACE	No Shock	C-91	91.8	14.90	235,000	710,000	3.00x10-6	91,000,000
	Light Shock	C-99	91.0	14.75	265,000	670,000	3.65x10-6	84,000,000
	Medium Shock	C-88	89.5	14.55	295,000	635,000	4.00x10-6	80,000,000
IMPACT	Light	C-85	88.4	14.25	315,000	600,000	3.75x10-6	77,000,000
	Medium	C-80	87.0	13.85	335,000	550,000	4.50x10-6	74,000,000
	Heavy	C-75	85.0	13.15	355,000	500,000	5.00x10-6	70,000,000

Note: Hardness values may vary plus or minus .2 to .3 on individual lots.

Leading brick manufacturer reports Talide-tipped pug mill paddles have outlasted 50 sets of hard-faced steel paddles to date—and are still in use. Operation involves mixing abrasive ceramic, clay and brick compositions.

TALIDE METAL is saving industry millions of dollars annually by wear-proofing vital parts on machine tools, presses, pumps, compressors and other types of processing equipment used in the steel, oil, chemical, plastic, auto, rubber, textile, glass, ceramic, mining and metalworking industry.



Send for new 76-page catalog 56-G or ask for sales engineer to call.

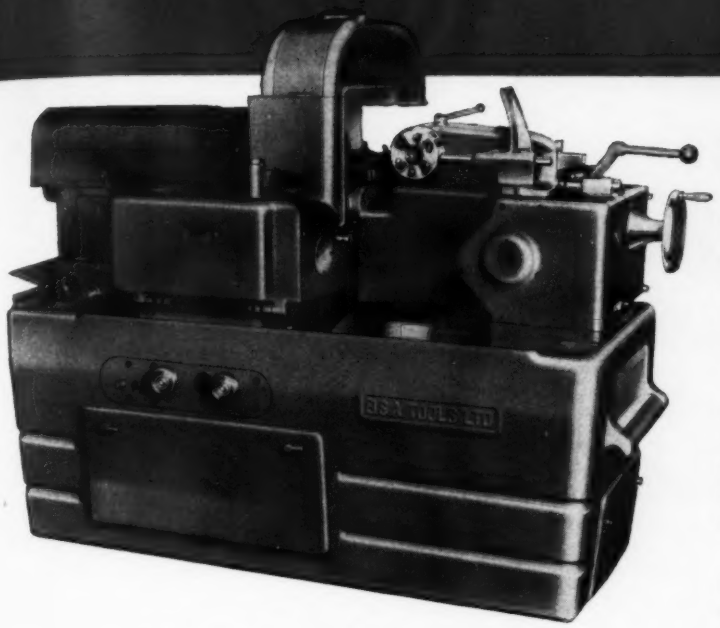
Metal Carbides Corporation
Youngstown 12, Ohio

METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 36

BSA first to provide UNIT REPLACEMENT of parts subjected to most wear

to keep important production flowing with new machine performance



With speeds, machining accuracy, ease of tooling and operation and maintenance equal or superior to any machine in its classification, BSA Single Spindle Automatic Screw Machines offer a very definite plus value through "*unit construction and replacement*" of work spindles, side slides, turrets and gear boxes.

Unit construction, plus extremely rigid, one-piece machine frame makes it possible to bring BSA machines back to factory standards of perfection quickly. You place an important unit back in the line with a minimum of lost production.

Shipment of replacement parts are speeded to you from National Acme, in Cleveland. Here, also, full engineering and design services as well as demonstration and service facilities, in the National Acme tradition, are available to you.

May we explain how "*unit construction and replacement*" can ease your production problems?

Additional Production Advantages of BSA

FIVE STANDARD CAPACITIES: ½" ¼", 1", 1¼", and 2".

WIDE RANGE OF SPINDLE SPEEDS—200 to 6000 on ½" machine, 69 to 1260 on 2" model.

Cams, change gears and tooling easily accessible FOR QUICK JOB-TO-JOB CHANGEOVER.

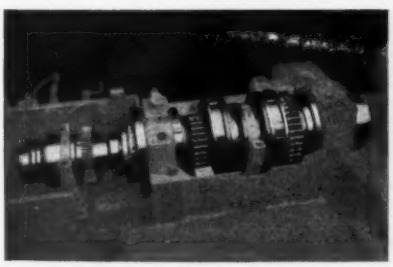
Unit construction provides quick access for EASY MAINTENANCE.

Special spindle mounting, DESIGNED TO REDUCE WEAR.

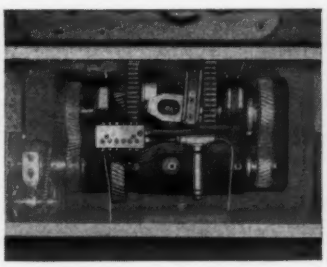
Positive chain drive from gear box to spindle PREVENTS SLIPPAGE.

All models use STANDARD AMERICAN TOOLING

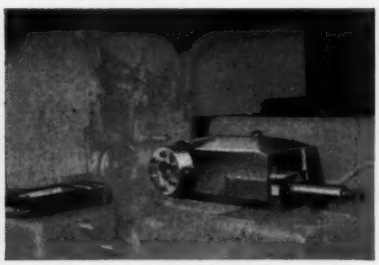
UNIT CONSTRUCTION SPEEDS REMOVAL OR REPLACEMENT



Work Spindle



Gear Box



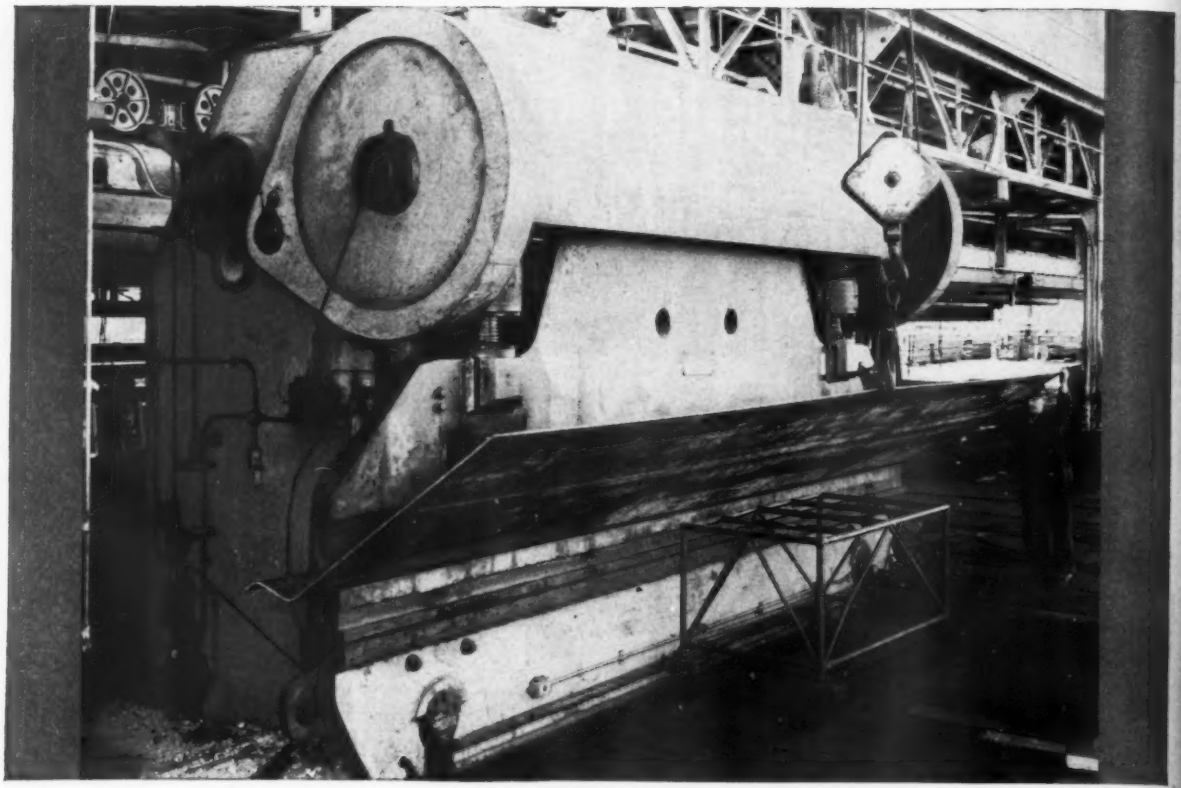
Side Slides and Turret

Distributed and Serviced in U.S.A. by...

National Acme

THE NATIONAL ACME COMPANY, 169 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 37



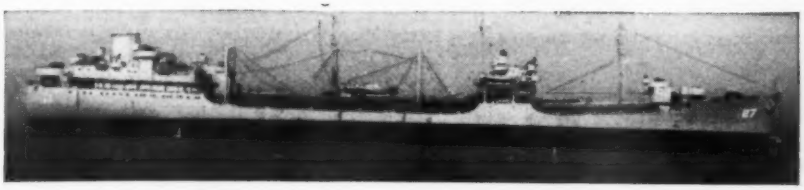
Fluted bulkhead plate being formed by Steelweld bending press in plate shop of Moore Dry Dock Company for bulkhead renewal job on U.S.S. "KASKASKIA" (A027). Size of plate: length 26', width 6' thickness ½".

Long a leading West Coast ship builder and marine repairs concern, the Moore Dry Dock Company, Oakland, California, has found a large Steelweld Bending Press to be a great asset in speeding the forming of heavy plate.

Ship repair, which constitutes an important part of the company's business, often requires replacement of large sections, such as bulkheads. This necessitates the forming of plates to various shapes to accurately replace those removed. Because of the power of their Steelweld and the ease of making adjustments, this work is carried on efficiently and satisfactorily.

The entire line of Steelwelds has an enviable reputation for continuous high-production performance. We urge you to get the facts on their many outstanding features.

U.S.S. KASKASKIA is typical of many ships which have had extensive bulkhead and other repairs at Moore Dry Dock Company.
Official U. S. Navy Photograph



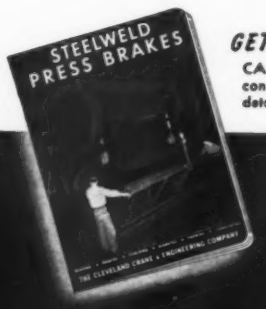


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Photo courtesy The Monarch Machine Tool Company

THE LATHE — *Monarch Series EE Model 1000 Precision Lathe*

THE OPERATION — *The turning of a stub shaft*

THE CHUCK — *Horton, of course*

HORTON CHUCK DIVISION
Greenfield Tap and Die Corporation
Windsor Locks, Connecticut

HORTON
Since 1851
CHUCK

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Coming Events

Aug. 5-6. National Screw Machine Products Association. Third National Sales Conference. Moraine Hotel, Highland Park, Ill.

Aug. 12-15. Society of Automotive Engineers. West Coast Meeting. Olympic Hotel, Seattle, Wash.

Aug. 20-23. Western Electronic Show & Convention. Cow Palace, San Francisco, Calif.

Aug. 29-30. Denver Research Institute, University of Denver. Fourth Annual Symposium on Computers and Data Processing. Albany Hotel, Denver, Colo.

Aug. 28-30. American Institute of Electrical Engineers. Pacific General Meeting. Chinook Hotel, Yakima, Wash.

Sept. 8-11. National Metal Trades Association. Eastern Plant Management Conference. Essex-Sussex Hotel, Spring Lake, New Jersey.

Sept. 9-12. Society of Automotive Engineers. Tractor Meeting and Production Forum. Hotel Schroeder, Milwaukee, Wis.

Sept. 9-13. Instrument Society of America. Twelfth Annual Instrument-Automation Conference and Exhibit. Cleveland Auditorium, Cleveland, Ohio.

Sept. 9-13. New York University College of Engineering. Third Annual Titanium Lecture Program. New York University, University Heights, N. Y.

Sept. 17-20. American Die Casting Institute. Annual Meeting. Edgewater Beach Hotel, Chicago.

Sept. 18-20. National Industrial Conference Board. Marketing Meeting. Waldorf-Astoria Hotel, New York City.

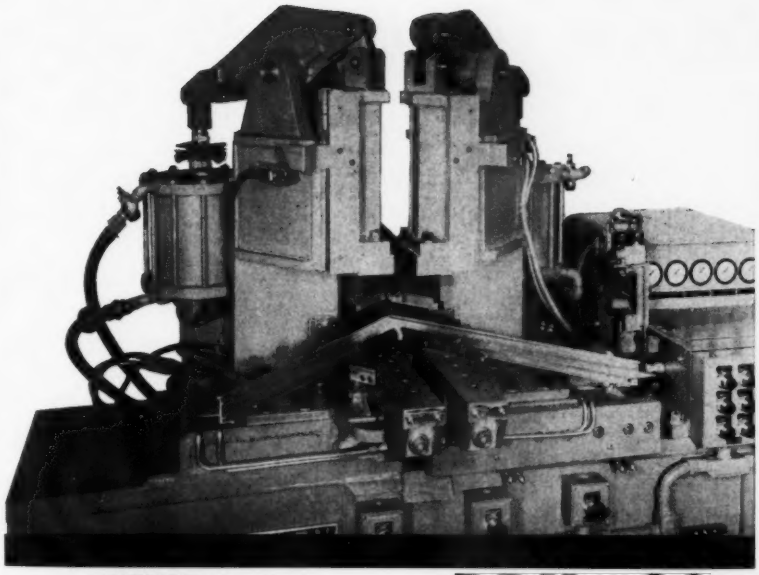
Sept. 19-20. Marking Device Association. National Meeting. Roosevelt Hotel, New Orleans.

Sept. 22-24. American Machine Tool Distributors Association. Annual Meeting. Hotel Cleveland, Cleveland.

Sept. 23-24. Steel Founders' Society of America. Fall Meeting. The Homestead, Hot Springs, Va.

Sept. 23-25. American Society of Mechanical Engineers. Fall Meeting. Statler Hotel, Hartford, Conn.

Sept. 24-25. Institute of Radio Engineers' Professional Group on Industrial Electronics, American Institute of Electrical Engineers, and Chicago sections of IRE and AIEE. Sixth Annual Industrial Electronics Symposium. Morrison Hotel, Chicago.



Darwin **PRK • 33 TOOL STEEL**

(Cobalt, High Carbon, High Chrome)
***Holds its edge at 1000° F.!**

Above is the Thomson Synchro-Matic Welder performing a miter weld on an aluminum window extrusion. "Pinch-off" dies of PRK-33, a Thomson development, support the work close to the point of weld. After welding, this PRK-33 die moves in to pinch off the flash close to the surface of the work. Eliminates most cleaning and finishing of the weld.

After testing many die steels, Thomson now specifies PRK-33. They have found PRK-33 to be the finest high carbon, high chrome, with cobalt, die steel available. Its production record, its ability to hold a hard edge at high temperatures far surpassed all other die steels tested. Heat treated and double drawn at 980°F. gives PRK-33 a secondary hardness of 59-61 Rc.

Want these qualities in the dies you buy?—Write for full information NOW!

Complete Line of highest grade Tool Steels, including PRK-33, DARWIN No. 1, NEOR, MINEOR, OHT, "MT6" and various grades of Hot Work Specialty Steels. Furnished in Bar Stock, Forgings, and Sand Castings, Drill Rod, Flat Ground Stock and Tool Bits.

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CIRCLE INFORM-A-GRAM KEY NO. 41

MANUFACTURING MEMOS

Celebrates 50th Anniversary . . .

● Pendleton Tool Industries, Inc. recently celebrated its 50th Anniversary. The Los Angeles firm manufactures hand service tools.

Receive Awards . . .

● Two awards were presented at the recent National Sales Executives' 22nd Annual International Distribution Congress. Stanley C. Allyn, chairman of National Cash Register Co., received the 1957 Business Statesman of the Year Award. The Annual NSE Management Award went to Don G. Mitchell, chairman and president of Sylvania Electric Products, Inc.

New Officer . . .

● Oscar B. Schier, II, has been designated secretary-elect of The American Society of Mechanical Engineers. This post is the chief administrative office of the Society. Mr. Schier succeeds Clarence E. Davies, who has retired.

Name Changes . . .

● Consolidated Electrodynamics Corp. has changed the name of its Electronic Industries Division to the Alectra Division. The change was made to eliminate confusion with similar names of other companies. The division's products include portable test instruments, printed wiring, transistor circuitry, and specialized electronic components.

● Disogrin Industries, Inc. is the new name of Greer Industries, Inc., manufacturer of a new urethane material called Disogrin. The chief operating officer is Robert E. Williams.

Mergers . . .

● Simplex Engineering Co., Inc. of Zanesville, Ohio, and Racine Hydraulics & Machinery, Inc., Racine, Wis., have merged. Racine Hydraulics manufactures a medium pressure line of hydraulic pumps, valves, power units, and controls, and Simplex, the Seco line of high pressure equipment of similar nature. Basic operations will continue unchanged by the two companies. M. E. Erskine will head Racine Hydraulics and T. E. Raymond, Sr., will operate the Simplex portion.

● The consolidation of Universal Hydraulics Machinery Co. and Johnson Machinery Co. has been disclosed. Both specialize in used and rebuilt plastic, hydraulic, rubber, and processing machinery. The combined organization will operate out of Johnson's Newark, N. J., plant.

Operations of the Carmet Division of Allegheny Ludlum Steel Corp. are now underway in a new plant at Bad Axe, Mich. This plant, which will produce cemented carbide tools, will receive its raw materials from the Carmet parent plant in Ferndale. Its operations will include milling, drilling, sawing, degreasing, induction heating, grinding, sand blasting, and heat treating.

◆

Crucible Steel Co. of America has opened an expanded specialty steel warehouse in Chicago. D. K. Stuart is serving as the new branch manager.

◆

Three firms have been licensed by The Cross Co. to build the Cross machine control unit. They are Scully-Jones & Co., Seibert & Sons, Inc., and Royal Design & Mfg., Inc. The unit provides for automatic tool programming.

◆

Columbia Steel Equipment Co., Inc. will join the group of industrial companies owned by Standard Pressed Steel Co. Columbia, which manufactures steel office furniture, recently moved into a new plant in Fort Washington, Pa.

◆

A new line of cemented tungsten carbide tool tips have been made available by Multi Metals, Inc. They are produced in a variety of grades for cutting plastic, non-ferrous metals, etc.

◆

Minneapolis-Honeywell Regulator Co. has purchased Raytheon Mfg. Co.'s 40% stock interest in Datamatic Corp. Datamatic was organized jointly by the two companies in 1955 to engage in the development of large-capacity high-speed electronic digital data-processing systems. With the recent purchase, Minneapolis-Honeywell now owns all the outstanding stock in Datamatic.

◆

Nilsson Gage Co., Inc. has been purchased by Boice Gages, Inc. of Hyde Park, N. Y. The newly acquired firm will be operated as Nilsson Gage Products, Inc., division of Boice Gages, engaged in further developing and marketing the Nilsson line of gages. Charles Nilsson will serve as vice president in charge of this division.

"These 'super-speed' inclinables give me twice the production . . . at about half the cost!"

From their special vibration-absorbing legs to their counterbalanced shafts, these presses are built for speed.

With such special features as bronze gibs... automatic lube systems... special clutches, brakes and flywheels, and equipped with precision feeds, they can knock out short stroke work at better than 500 strokes a minute! They're all new, all Bliss, and the cost is low—surprisingly so.

These are the latest members of Bliss' line—the line that offers industry its most complete choice of types and sizes. And with no axe to grind for any one type, you can be sure of impartial pressroom counsel—by Bliss.

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100 years of making metal work for mankind

PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.

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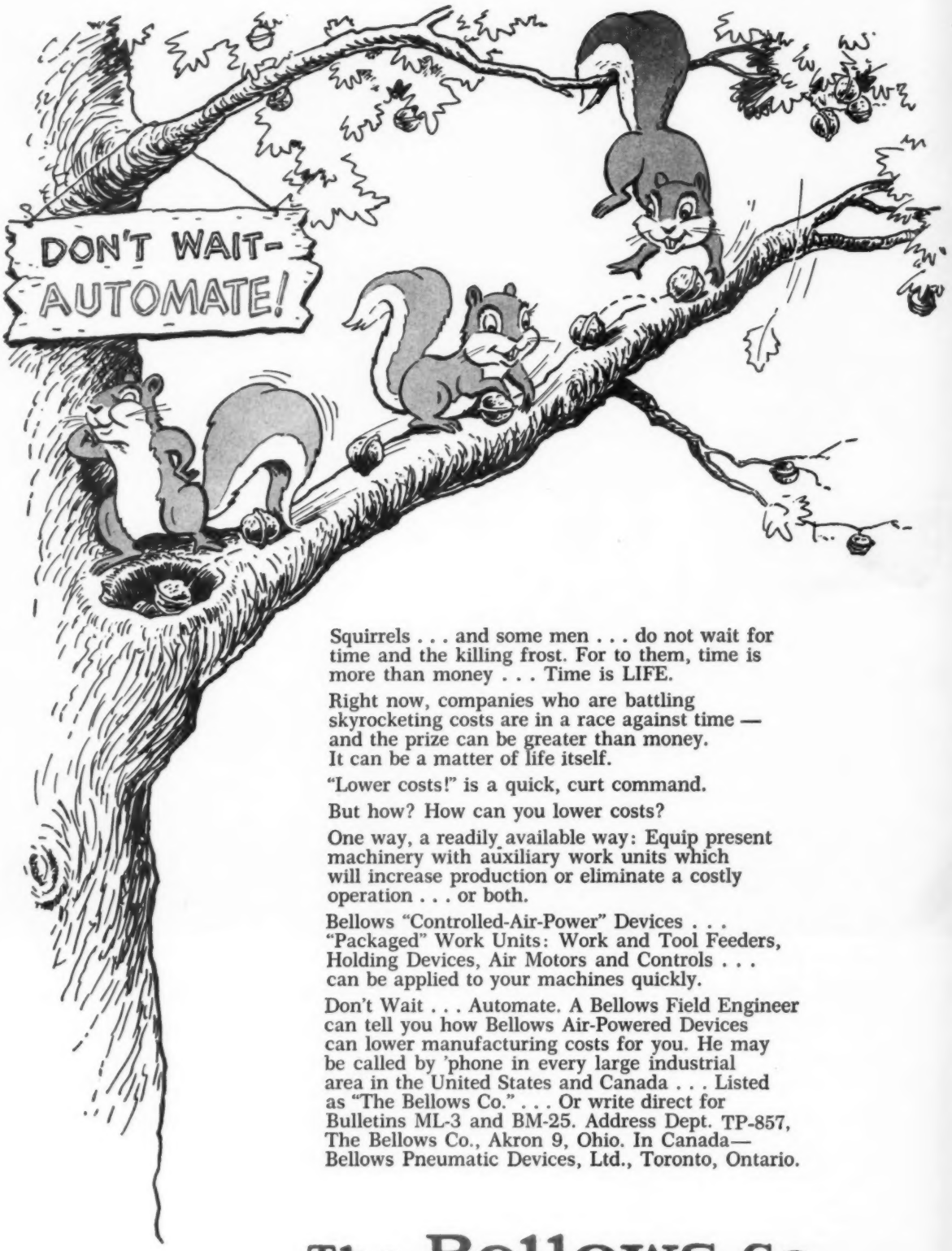

Squirrels . . . and some men . . . do not wait for time and the killing frost. For to them, time is more than money . . . Time is LIFE.

Right now, companies who are battling skyrocketing costs are in a race against time — and the prize can be greater than money. It can be a matter of life itself.

"Lower costs!" is a quick, curt command.

But how? How can you lower costs?

One way, a readily available way: Equip present machinery with auxiliary work units which will increase production or eliminate a costly operation . . . or both.

Bellows "Controlled-Air-Power" Devices . . . "Packaged" Work Units: Work and Tool Feeders, Holding Devices, Air Motors and Controls . . . can be applied to your machines quickly.

Don't Wait . . . Automate. A Bellows Field Engineer can tell you how Bellows Air-Powered Devices can lower manufacturing costs for you. He may be called by 'phone in every large industrial area in the United States and Canada . . . Listed as "The Bellows Co." . . . Or write direct for Bulletins ML-3 and BM-25. Address Dept. TP-857, The Bellows Co., Akron 9, Ohio. In Canada— Bellows Pneumatic Devices, Ltd., Toronto, Ontario.

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MANUFACTURERS OF CONTROLLED-AIR-POWER DEVICES FOR FASTER, SAFER, BETTER AND **LOWER-COST** PRODUCTION

860-B-1

CIRCLE INFORM-A-GRAM KEY NO. 44

NEW YORK

"An irregular-shaped hole being ground to within .0002" on the No. 2 Moore Jig Grinder. The machine can do contour grinding of almost any size and shape."—*from facilities booklet of August W. Holmberg & Co., Inc., Flushing, N. Y.*

MISSOURI

"Two No. 2 Moore Jig Borers...permit Ehrhardt to locate and bore holes accurately and to inspect the finished work."—*from facilities booklet of Ehrhardt Tool and Machine Co., St. Louis, Missouri.*

"FACILITIES, FACILITIES, FACILITIES..."

How Leading Tool and Die Shops Across the Nation Feature MOORE Jig Borers and Jig Grinders

Today, top contract tool and die shops often rely on illustrated booklets to sell prospects on their facilities. And they often rely on pictures of their Moore Jig Borers and Jig Grinders to indicate the degree of precision work they can do. It's particularly significant that leading contract shops choose Moore machines for "double duty"—in the toolroom and on the printed page—for these owner-managed firms are understandably deliberate and judicious in selecting machine tools. Write today for detailed bulletins on Moore's top-billed toolroom teammates.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Connecticut

CALIFORNIA

"This precision jig grinder is a Moore No. 2. It is used for producing precision holes, contours and surfaces to accurate lead screw settings within .0001" in heat-treated materials."—*from facilities booklet of Mechanical Specialties Co., Los Angeles, Cal.*

HOLES, CONTOURS AND SURFACES
Moore's *all-new* book tells you how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

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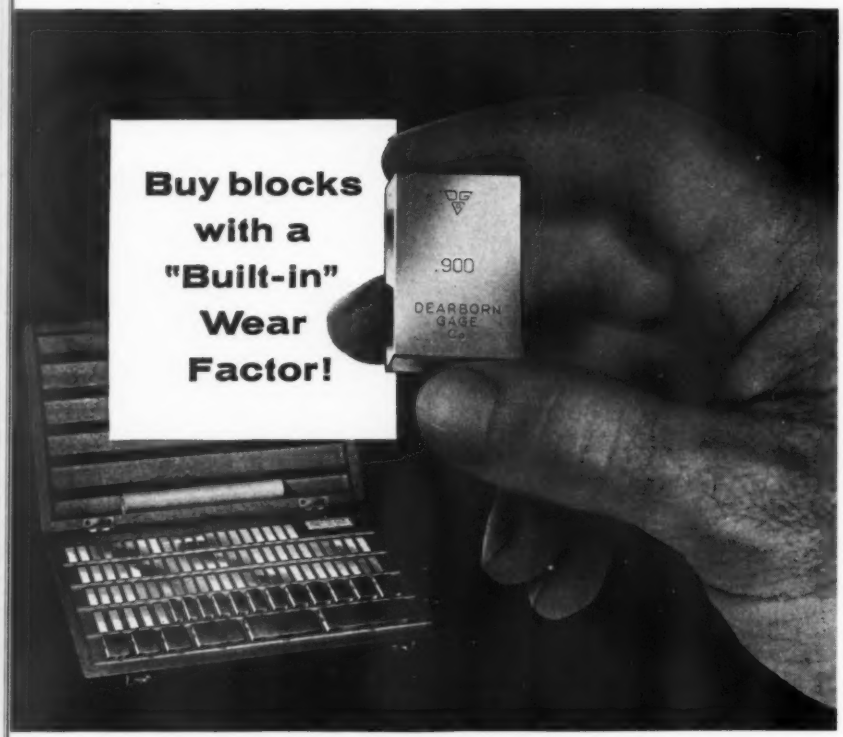

ELLSTROM CHROMIUM PLATED GAGE BLOCKS
are guaranteed "minus nothing" from nominal size!

Here at last are gage blocks with a positive "built-in" wear factor! The only blocks ever produced and priced as standard with dimensional accuracy unconditionally guaranteed to be within specified millionths on the "plus" side of nominal block size and minus "zero" . . . absolutely nothing . . . undersize!

This complete elimination of the conventional minus tolerance gives you, the gage block user, three new and exclusive benefits. First, it provides positive assurance against receiving new blocks that are actually "worn" undersize during manufacture before they are ever used. Second, it gives you finer, more practical accuracy . . . with the sure knowledge that every Ellstrom block you buy will start wearing *toward* its nominal size rather than *away* from it. And third, it gives you a guaranteed minimum wear factor equivalent in millionths to the full minus tolerance specified as standard for all other makes of blocks!

Write for descriptive literature containing complete price information today!

ELLSTROM STANDARDS DIVISION
DEARBORN GAGE COMPANY
"Measuring in Millionths for Three Generations"
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Ellstrom Gage Block Accuracy Guarantee

"W"—WORKING ACCURACY BLOCKS
Measured Length: +.000008"/−.000000"
Parallelism: .000004" Flatness: .000004"

"I"—INSPECTION ACCURACY BLOCKS
Measured Length: +.000004"/−.000000"
Parallelism: .000003" Flatness: .000003"

"L"—LABORATORY ACCURACY BLOCKS
Measured Length: +.000002"/−.000000"
Parallelism: .000001" Flatness: 000001"

Ellstrom—your best buy in gage blocks for shop and tool room use, inspection and laboratory applications. Available in 28 standard sets ranging from 8 to 92 blocks in both square and rectangular styles with or without basic gage block accessories.

CIRCLE INFORM-A-GRAM KEY NO. 46

BEARING DESIGN AND APPLICATION, by Donald F. Wilcock and E. R. Booser. Published by McGraw-Hill Book Co., New York 36, N. Y., 1957. 470 pages, 225 illustrations, $12.50.

This is a practical bearing guide for the machine designer and also for service personnel in metalworking and manufacturing industries. Much of the material is from the authors' experience with bearing designs for electrical apparatus, household appliances, instruments, and aircraft units, and also from the Lubrication Division of the American Society of Mechanical Engineers and the American Society of Lubrication Engineers.

The subject is considered from three aspects: design of the bearings, including geometry, general configuration, and tolerances; materials from which the working parts are made; and the lubricant which serves to minimize friction and wear on the bearing during its operation. Rolling element bearings, slider bearings (both journal and thrust), bearing materials, and troubleshooting are covered.

◆

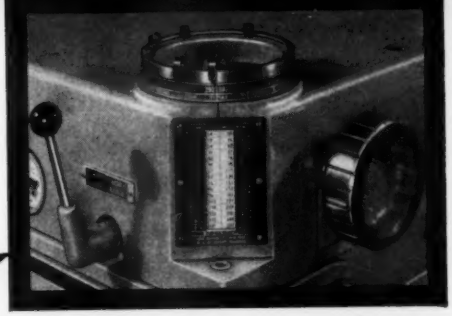
SATISFYING THE SALARIED EMPLOYEE. Published by the Industrial Relations Division, National Association of Manufacturers, 2 E. 48 St., New York, 1957. 64 pages, $.50.

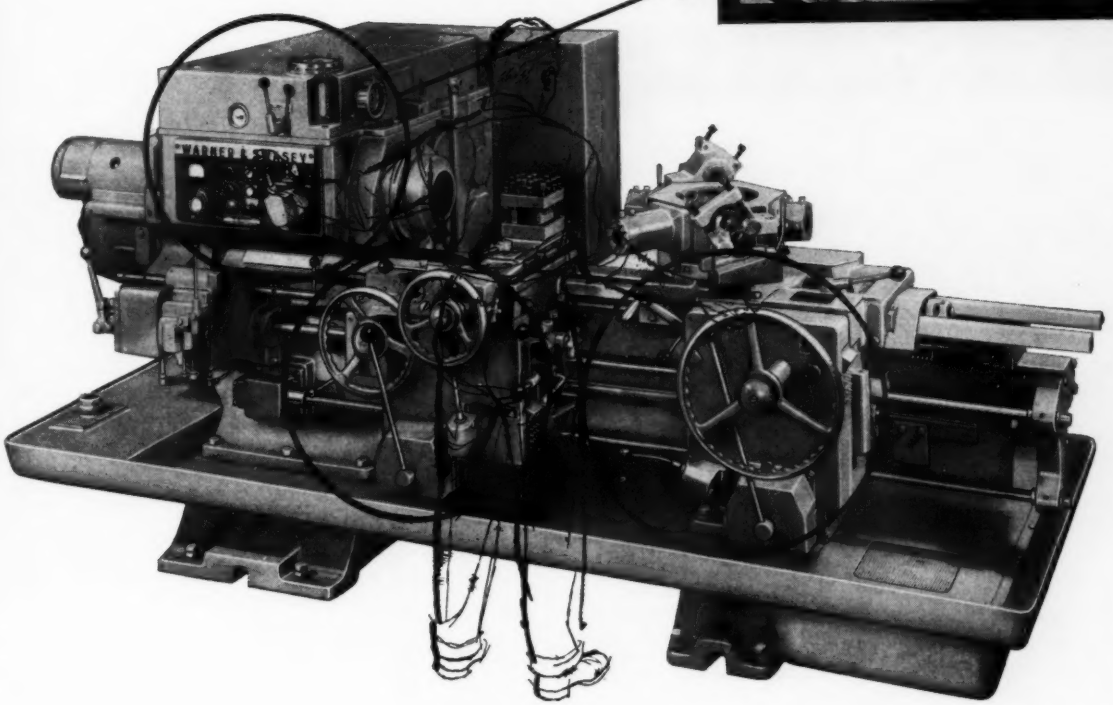
The National Association of Manufacturers' study on satisfying salaried employees is a practical manual for building better relations with white-collar people — technical and professional, clerical and stenographic, supervisory and administrative, engineering and scientific, sales and research, and staff personnel. It covers four areas which the NAM says hold the answer to job satisfaction in the office and laboratory and sets forth sound practices in each. These are status and recognition, compensation, communication, and supervision.

Clifford F. Hawker, vice president of Armstrong Cork Co. headed the NAM's advisory group on salaried personnel, which did the research for the paper-bound book. Representatives of du Pont, Eastman Kodak, General Motors, General Electric, Ford, Goodrich, and other companies leading in the industrial relations field, assisted him in gathering material for the book.

. . . *Continued on Page 48*

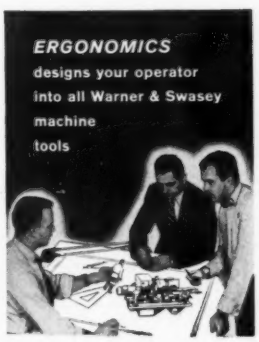
This exclusive Warner & Swasey Speed Preselector, heart of the "zoned controls" system, enables the operator to preselect the correct speed for each cut, with just a glance-and-a-twist of the knurled knob. Proper speeds are chosen for the required cuts on the job and then marked in sequence with numbered clips placed on the top of the chart drum. Just a touch of the lever instantly shifts the machine to the next desired speed.





Warner & Swasey "ZONED CONTROLS"

boost production by helping increase operator efficiency



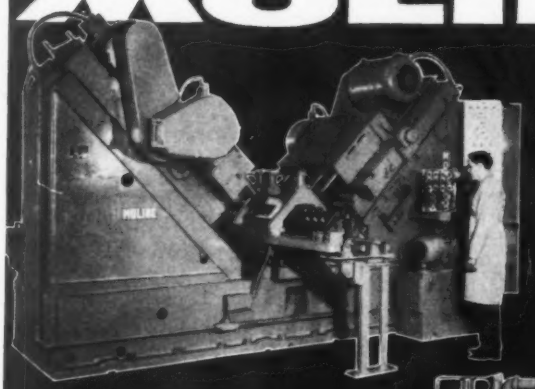
Known throughout industry as "the operator's machine", Warner & Swasey turret lathes are painstakingly designed with the human element in mind. They provide easy-to-handle operating controls, compactly arranged at convenient levels that minimize stooping and reaching — all of which contribute to increased operator satisfaction and higher production. Heart of the "zoned controls" system is Warner & Swasey's exclusive Speed Preselector — calibrated in surface feet and spindle RPM's versus work diameters — that encourages operator use of the proper spindle speeds for the particular job being machined. Additional single lever control features praised by operators include: A fast, simple change for spindle speeds; apron feed levers with "feel" control; four-way carriage rapid traverse; easy operating turret units and hydraulic collet chuck and bar feed control. For more detailed information about the adaptability of Warner & Swasey turret lathes to your particular machining problems, call in our Field Representative, today.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

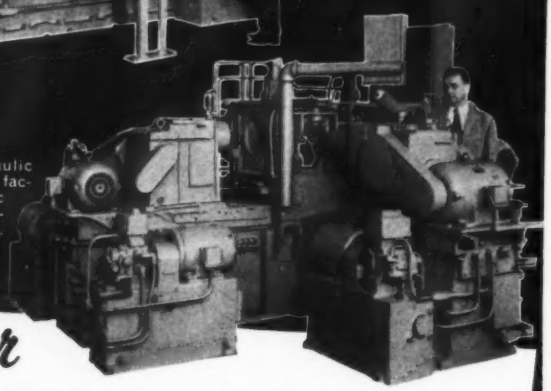
YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

CIRCLE INFORM-A-GRAM KEY NO. 47

MOLINE



No. 13CB V-type cylinder boring unit is used either as an individual machine or as one of several automated units in a transfer line for boring automotive engine cylinders.



MR138 four-way, hydraulic feed, drilling, boring and facing machine with hydraulic clamping fixture for tractor main frame housings.

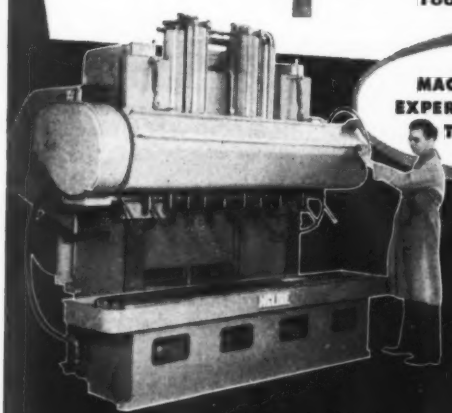
For Greater

PRODUCTION . . . EFFICIENCY . . . SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as...

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

OVER 55 YEARS OF MACHINE TOOL ENGINEERING EXPERIENCE IS AT YOUR SERVICE. TELL US YOUR PARTICULAR PROBLEM



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HD67 hydraulic rail feed, straight-line type, multi-spindle drilling machine. Six-foot rail length as shown; also available in eight and ten-foot lengths.

No. 116-U hydraulic rail feed, universal joint type driller with 16 two-speed and neutral top drivers plus four-speed quick, change gear box. Spindles illustrated are 1⅛" drill capacity each in mild steel.

MOLINE TOOL CO. HALF-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY

REPRESENTATIVES IN PRINCIPAL CITIES

100 20TH STREET · MOLINE, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 48

. . . Reviews from page 46

AUTOMATIC CODING, Monograph No. 3. Published under the auspices of the Journal of the Franklin Institute, Philadelphia, Pa., 1957. 118 pages, $3.

The complete record of this year's Franklin Institute symposium on automatic coding is in this paper-bound book. A total of eight papers are included, covering these topics: Automatic Coding at GE; Systems of Debugging Automatic Coding; An Automatic Coding System for the IBM 705; The Procedure Translator — A System of Automatic Programming; OMNICODE — A Common Language Programming System; A Matrix Complier for Univac; A Mathematical Language Compiler; and A Mechanized Approach to Automatic Coding.

◆

PLASTIC TOOLING BIBLIOGRAPHY, by Orville D. Lascoe. Published by American Society of Tool Engineers' Research Fund, 10700 Puritan Ave., Detroit 38, Mich., 1957. 46 pages, $1.50 ($.75 to ASTE members).

This extensive bibliography was compiled by Professor Lascoe of Purdue University's Industrial Engineering department as part of the plastic tooling research project currently being conducted under the auspices of the ASTE Research Fund. The paper-bound report contains 254 references and abstracts of every major writing concerning plastic tooling since its inception.

◆

PRODUCTION FORECASTING, PLANNING, AND CONTROL, second edition, by E. H. MacNiece. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 1957. 374 pages, $8.25.

The production management methods and techniques are reduced to a set of principles in this book, with specific examples to illustrate the effective application of the principles. Although the production picture is covered from the engineering viewpoint, material on social and economic implications supplement the treatment presented by Mr. MacNiece.

New in this edition are chapters on automation and on specialization, standardization, and simplification; material on operations research and ratio-delay analysis; a section on level production and its ratio to guaranteed annual wages; and a first-hand report on European production engineering education and practices.

cutting tools for cutting costs

THE specially-developed "Hi-Lo" tooth design of M&M Triple Chip cut-off blades and slitting saws distributes cutting strain, permitting higher speeds and heavier feeds, while greatly prolonging tool life. Material is cut square, burrless, with milled finish.

And M&M's factory repair, resharpening and resegmenting service, the fastest in the industry, helps you avoid excessive inventories . . . minimizes costly downtime.

Your local M&M dealer stocks the complete line of M&M cutting tools and is always at your service to help solve tough or unusual sawing problems. Call him today.

FREE — Send today for your copy of M&M's Circular Sawing Handbook, a pocket-sized guide to sawing operations.

Q *Quality*
S *Service*
A *Availability*

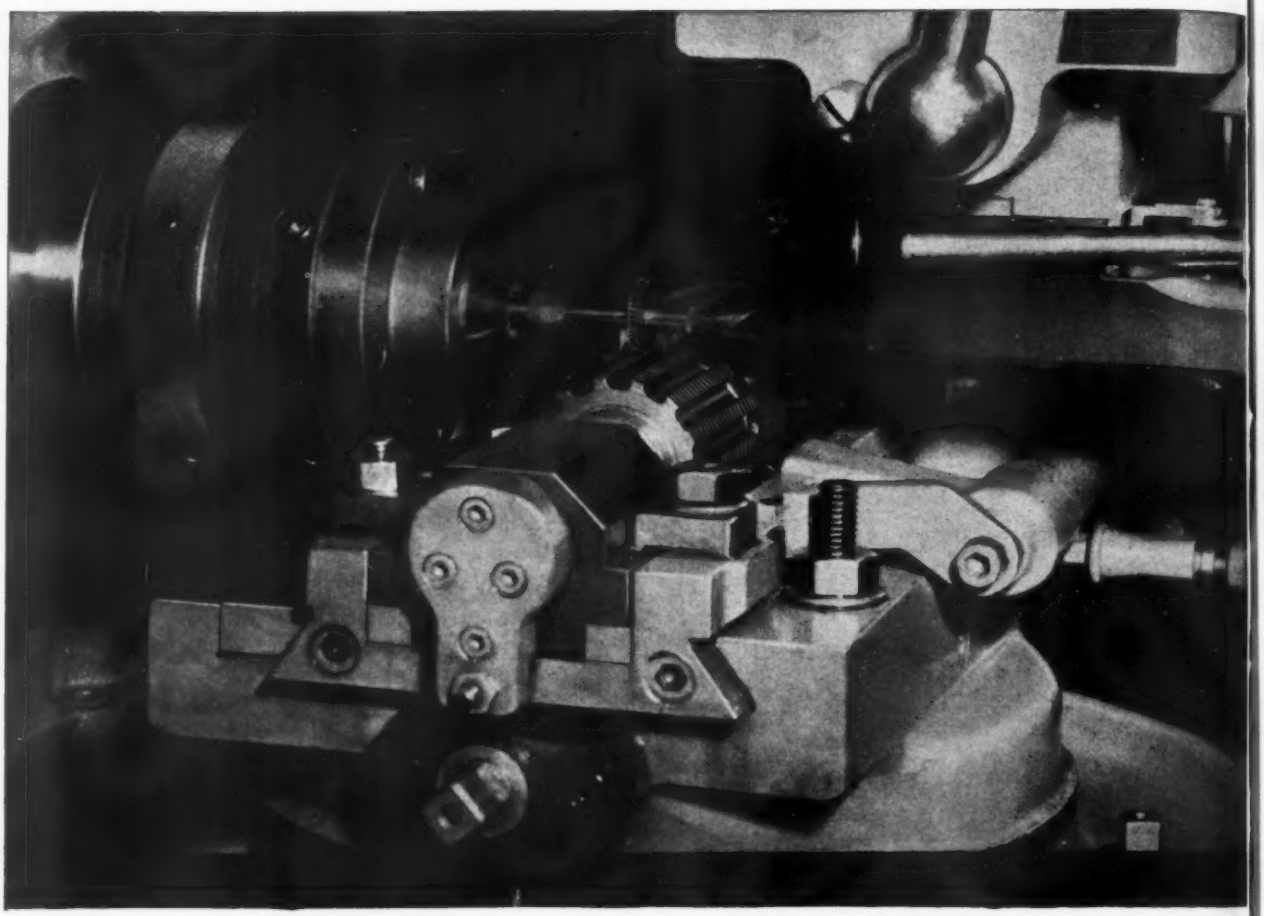
MOTCH AND MERRYWEATHER

Cutting Tool Manufacturing Division
Cleveland 17, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 49

HOBBING PRECISION GEARS

within precision Class 2 AGMA tolerances.....



Fine-pitch instrument gears are cut on Barber-Colman Precision No. 6-10 Hobbing Machines at Belock Instrument Corporation. For their most accurate gears, Belock uses Barber-Colman Class AA hobs exclusively.

with standard-type precision hobbing machines

The Belock Instrument Corporation manufactures complex electronic and electromechanical systems and components. The constant demand placed on them for greater accuracy in these instruments requires all gears to be cut to very close tolerances and yet be completed on a practical production basis.

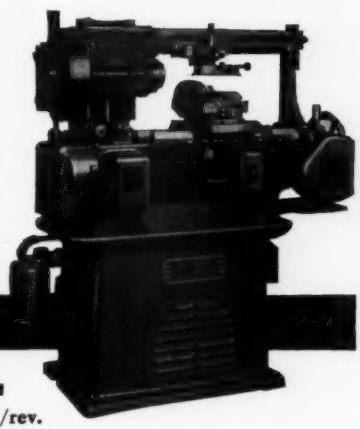
Belock hobs such gears consistently within Precision Class 2 AGMA tolerances, using a battery of *standard-type* Barber-Colman Precision No. 6-10 hobbing machines. These are unusually close tolerances and the use of *standard-type machines* for these gear accuracies is a good reason for taking a close look at the elements and methods they employ.

here's how they do it:
Gear blanks are machined to Precision AGMA tolerances. Then, for maximum accuracy in hobbing all precision gears, Barber-Colman Class AA single-thread ground hobs are used. These hobs are manufactured with tapered bores, since taper-bore hobs can, with greater ease, be mounted more accurately on the hob arbor to eliminate runout. These hobs are resharpened to original class AA accuracy using a Barber-Colman No. 6-5 Hob Sharpening Machine.

The gears are finish-hobbed on Barber-Colman Precision No. 6-10 Hobbing Machines. These machines hold a precision relationship between the rotation of the work and the rotation of the hob which allows them to consistently hob gears to these fine tolerances.

Barber-Colman Precision No. 6-10 Hobbing Machines are built with large precision index worm gears and single-thread worms for maximum tooth spacing accuracy. All vital machine parts are specially selected for close tolerances.

If you have a problem of producing consistent accuracy in gear cutting, consult Barber-Colman Hobbing Engineers for assistance. They can help you obtain any class of accuracy you desire with the most practical equipment for doing it.



this is an actual production record:

GEAR
Diametrical Pitch — 64
Pressure Angle — 20°
Outside Diameter — .7812"
Pitch Diameter — .7500"
Face Width — .093"
Material — 303 Stainless, 30-35 RC

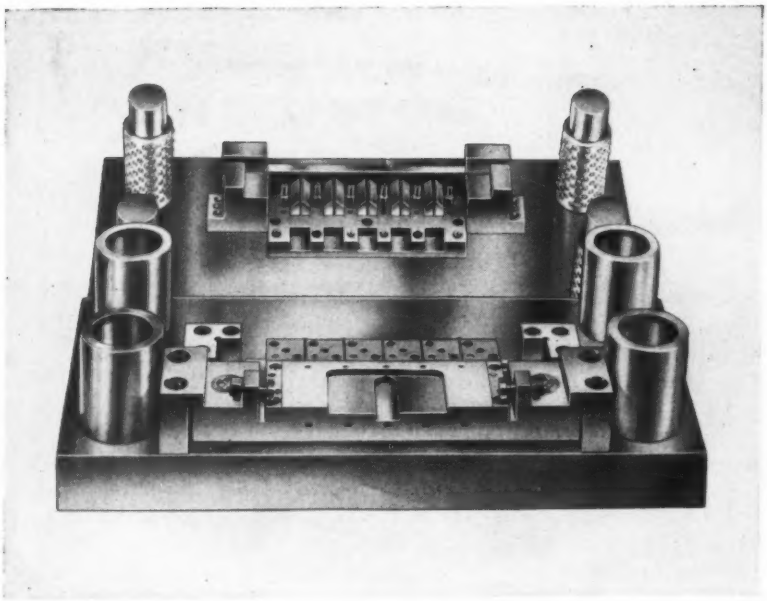
HOB
Class AA Ultra-Precision
2" Diameter, Taper Bore
Pieces per Sharpening — 720
Stock Removal per Sharpening — .005"

OPERATION
Feed — .015"/rev.
Speed — 120 sfm

BARBER-COLMAN COMPANY
6108 ROCK STREET • ROCKFORD, ILLINOIS
Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

CIRCLE INFORM-A-GRAM KEY NO. 51



Abrasion KO's Steel Dies at 20,000 Pieces . . . Carbide Runs 2 MILLION!

100-TO-1 INCREASE REDUCES DIE COSTS, CUTS DOWN-TIME, UPS OUTPUT

Rectifier plates are produced by blanking out the required shapes from sheet aluminum on which a coating of selenium has been deposited. While the aluminum itself is easily worked, the selenium coating is extremely abrasive. As a result, a leading rectifier manufacturer found that his steel dies averaged only 20,000 pieces before they became dull and started to produce a heavy bur that made the plates useless.

CAUSED EXCESSIVE DOWN-TIME

At this point it was necessary to stop production and re-grind the dies. Since this meant taking down and re-assembling, a 4-hour period was required. Maintenance costs were very high and important production time was lost.

INVESTIGATED CARBIDE

To cut down these production losses and reduce the high maintenance costs, the manufacturer decided to investigate carbide dies. He called on Jaquith Carbide . . . an organization with the specialized carbide experience and know-how needed to design and produce the right die for this operation and to estimate probable production increases and long-run savings. Jaquith handled the problem from sample part to finished, ready-to-run die, and carbide went to work on the production line.

CARBIDE OUTLASTS STEEL 100-TO-1

Harder than steel and nearly *twice* as dense, carbide proved to be the ideal die material for this abrasive material. Two *million* pieces are now produced without the dies requiring any maintenance at all . . . output is far greater, costs far lower.

THE RIGHT DIES . . . FROM THE RIGHT SOURCE

Wherever long production runs, close tolerances or abrasive materials are involved, the higher initial cost of carbide dies is an investment that will pay for itself many times over in increased die life, lower long-run die costs, faster production and reduced maintenance costs. And for the *right* carbide dies for *your* operations, there's no finer source than Jaquith Carbide. Send us your prints . . . or production drawings. We will be glad to furnish prompt quotations.

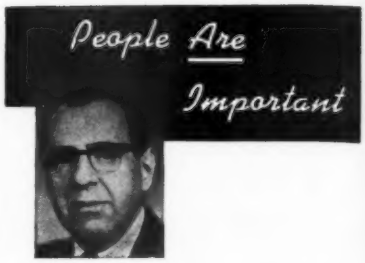
Write to Jaquith Carbide Division, 15 Stewart Street, Lynn, Massachusetts . . . or telephone LYnn 8-9754.

JAQUITH CARBIDE

DIVISION OF PRATT & WHITNEY COMPANY, INC.

SPECIAL DIES • COLD HEADER PARTS • WEAR PARTS

CIRCLE INFORM-A-GRAM KEY NO. 52



by Erwin K. Taylor, Ph. D.
President
PERSONNEL RESEARCH AND DEVELOPMENT CORP.
Cleveland 20, Ohio

EVALUATION DEFICIENCY

THERE ARE SINS of omission and there are sins of commission. In the June and July issues of TOOLING & PRODUCTION we concerned ourselves with Evaluation Contamination. These contaminating factors can all be classified as sins of commission, and it is practically impossible to evaluate a worker for possible promotion to supervision without some contamination creeping into the picture. All that we can hope to do in these pages is make the evaluators aware of the existence of contamination and to point out some of the major sources. We hope, then, that they will be able to avoid some of the major pitfalls by which they would otherwise be entrapped.

The major sin of omission in performance evaluation is evaluation deficiency. Simply stated, this is nothing more than the failure to include in the evaluation all aspects of the job (for which the evaluation is being made) that are *important* to success in it. Because of the complexity of supervisory jobs, it is impossible to evaluate applicants so as to predict performance on *all* phases of their work.

Because we have so often found that managements rarely take time to systematically think about what a foreman actually does, and what kind of person he needs to be to do it well, the Personnel Research and Development Corporation has evolved a procedure that has been successfully employed in a number of situations.

Here's how it works.

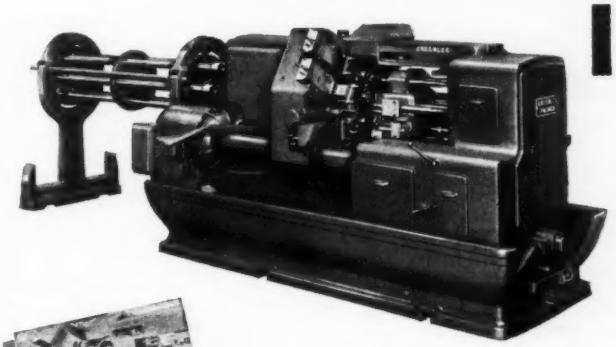
A professionally trained personnel technician from our staff meets with the production management of the client firm. The people who will attend this conference vary of course from company to company. In some cases, the president or vice president participates. Plant managers, production managers, heads of production departments, superintendents,

. . . *Continued on Page 54*

1. Simplified cross-slide camming
2. Interchangeable cross-slide tool holders
3. Quick-adjusting stroke mechanism
4. Rapid speed and feed changes
5. Wide-open, easily reached tooling area
6. Built-in threading feed and drive
7. Easily accessible main toolslide holders
8. Stationary type collets changed quickly

eight big reasons why you get *Fast Setups* on GREENLEE BAR AUTOMATICS

In plant after plant countless hours of setup time are saved each year on Greenlee Bar Automatics. Similar savings in time and money can be achieved in your own plant. Greenlee has on-the-job case studies to prove it. Whether your responsibility lies in the field of management . . . production . . engineering . . . or purchasing you owe it to yourself and your company to call in the Greenlee man. Let him show you why and how faster setups on a Greenlee pay off in greater profits.



PRODUCTION MACHINERY
GREENLEE

4-SPINDLE...6-SPINDLE
SECOND-OPERATION
PNEUMATIC STOCK FEED

WRITE TODAY
FOR CATALOG
A-405

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
2048 Mason Avenue
Rockford, Illinois

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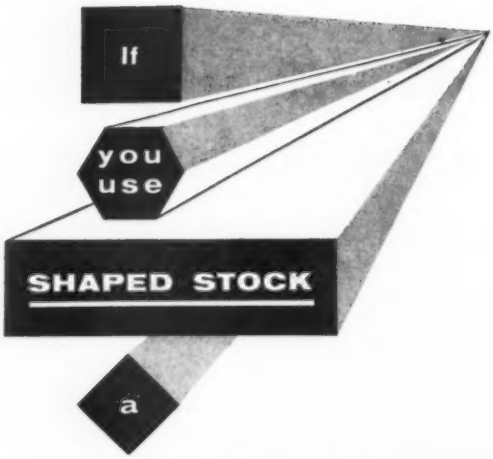


SHUSTER

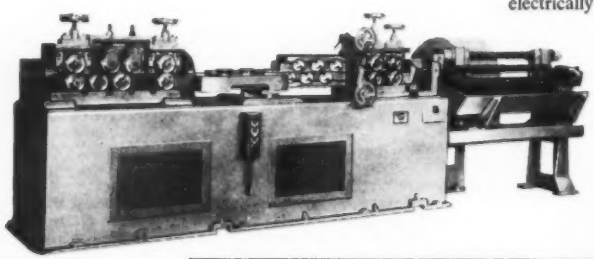
Shape Stock Straightening and Cutting Machine

Gives It To You Straight!

SHUSTER, the nation's oldest name in wire straightening and cutting, now offers a *complete* line of shape stock machines — first in the field again! For manufacturers of electric motors, wrought iron furniture, and wherever shape stock in volume is needed, SHUSTER offers the economical answer to accurate, straight, square cut stock.

3AVF

Capacity: to ⅜" square, or ¾" width. Infinite variable speed drive — geared to feed *76* to *228* *feet per minute*. Solenoid operated roll-type clutch — electrically controlled cut-off.



Other Shuster Shape Stock Straighteners			
	Geared to Feed	Square	Max. Width
1AF	150 FPM	1/8"	1/4"
1AVF	50-200 FPM	1/8"	1/4"
2AF	125 FPM	3/16"	3/8"
2ABF	120 FPM	1/4"	5/8"

Write today for complete details!

METTLER
MACHINE TOOL, INC.
155 West Adeline Street, New Haven, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 54

. . . Deficiency from page 52

and general foremen are the kinds of people who have participated. We have found that the group should consist of not less than four, nor more than eight, participants. We have found it essential that the meetings be conducted away from the plant.

Discussion itself revolved about the point of "What does this company want and expect of its first line supervisors?" Where good job descriptions existed, they were used as a point of departure. Where they did not, we usually started with a case study, preferably of an outstanding foreman. In what ways is such a man outstanding? What is there about what he does and how he does it that makes him better than other men on the same job? It does not take much to start the ball rolling.

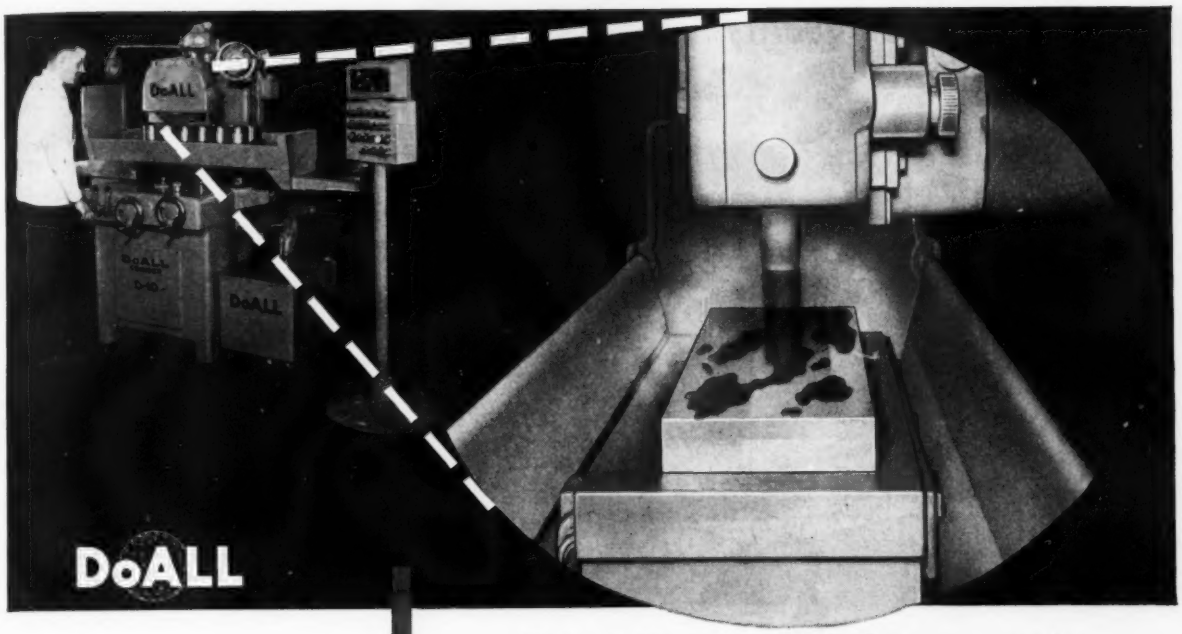
And, once it gets started, it generally snowballs at a rather rapid rate. Care needs to be exercised to avoid chasing rabbit tracks and avoid beating dead horses. Sometimes it turns out on analysis that the foreman thought to be outstanding was not really so. Frequently there is disagreement among the participants as to what a foreman's role should be and what constitutes effective foreman behavior. Executives participating in such conferences have sometimes discovered that hitherto unrecognized but basic disagreements existed among them and that these needed to be resolved before much progress with respect to improved foreman selection could be made. The airing and viewing of differences have been looked upon by the concerned managers and executives as a healthy and desirable practice.

When I first began using this technique, I tried to participate in discussions and at the same time take extensive notes of the important points that were covered. I soon discovered that things generally moved too fast and furiously to rely on memory or notes, and that trying to get things down on paper interfered with my effectiveness as a participant. After about two sessions of enduring the frustrations of trying to play a dual role, I surrendered the observer function to a tape recorder, thus freeing myself completely to participate. The recordings could be analyzed at leisure after the conference, and many points of importance which might otherwise be lost in the shuffle would be salvaged.

It is difficult to predict how long such conferences will require. They seldom last less than a day and I have known them to go on for as many as three. When the conference has been concluded, the tapes are played back and analyzed by qualified personnel technicians. In addition to the participating technician,

. . . *Continued on Page 56*

"Cool Grinding" Proves 1000 Times More Effective than Flood Cooling



Grind Faster, Grind Accurately, More Confidently

Atomized coolant, as shown at left, is 1000 times more effective as a heat absorbent than liquid coolant. "Cool Grinding" puts this atomized coolant directly at the point of work-wheel contact. Temperatures are reduced as much as 1300°F as compared to flood cooling.

Aids Precision in Grinding—Efficient heat dissipation prevents expansion—helps assure close control of dimension and parallelism.

Ground Parts Last Longer—"Cool Grinding" eliminates burning, checking and stresses—a source of premature failure of ground parts resulting from high heats and quick quenching.

Increased Production—Grinding can be done at faster rates, without heat expansion or damage.

Dry Grinding Visibility—Mist does not obscure work, visibility is unlimited.

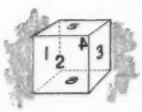
Wheel Life Increased—Continuous flushing and cooling action *in* the wheel greatly increases its life.

Standard Grinding Wheels—No need for wheels with "special" arbor holes.

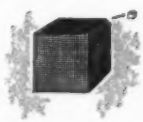
Coolant Recirculates—Saves on coolant. Special filter cleans the coolant before reuse.

Free In-Your-Plant Demonstration—DoALL will bring a grinder to your plant and show you how to increase your grinding profits. Write: **The DoALL Company, Des Plaines, Illinois**

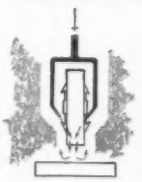
Mist Provides 1000 Times More Heat Absorbing Surface



A cubic inch of coolant offers six square inches of heat absorbing surface.



Atomized, each of the 1,000,000,000 cubes offers .000006 square inches of surface or total of 6,000 *square inches* over all.



In "COOL GRINDING" coolant is fed to the sides of the wheel. Centrifugal pump action draws the coolant into and through the wheel. It emerges atomized, right at cutting edge.

FREE MOVIES—Sound and color to show you the ultimate in precision grinding. Call DoALL locally or write.

FREE CATALOG—Shows design and construction of DoALL Grinders and accessories including "Cool Grinding".

Friendly DoALL Sales-Service Stores In 38 Cities.

Cool Grinding U.S. Pat. No. 2470350

THIS IS A TYPICAL DoALL STORE

CIRCLE INFORM-A-GRAM KEY NO. 55

How
PHILCO
protects transistor quality
with 3-D
MICRO-VISION

From quality control on automated assembly lines to final inspection, Bausch & Lomb Stereomicroscopes assure precision production at the Lansdale Tube Company, Division of Philco Corporation. Inspectors see clear, sharp magnified views of tiny transistor components barely visible to the unaided eye. Work is seen right-side-up, in natural 3-dimensional relief. Freedom from eyestrain and discomfort increases efficiency. The result: precision standards that assure distortion-free sound in Philco-equipped transistor radios . . . speed and reliability in Philco-equipped computers.

MAIL COUPON TODAY FOR VALUABLE
3-D MICRO-VISION DATA BOOK

BAUSCH & LOMB
SINCE 1853

America's only complete optical source . . . from glass to finished product.

BAUSCH & LOMB OPTICAL CO.
77320 ST. PAUL ST., ROCHESTER 2, N. Y.

Please send me Stereomicroscope Manual D-15, including actual stereo views, how and where to use stereomicroscopes, and Selector-Chart which fits exact model to specific job needs.

NAME.....
TITLE.....
COMPANY.....
ADDRESS.....
CITY..... ZONE..... STATE.....

CIRCLE INFORM-A-GRAM KEY NO. 56

. . . Deficiency from page 54

there is a colleague who, not having been exposed to the meeting itself, brings a fresh viewpoint to the analysis. The analysis of the tape takes four to five hours per conference hour.

The end product of the analysis is a comprehensive and somewhat detailed description of the ways in which successful foremen differ from those who are not successful. These findings are of course formalized and submitted to the concerned members of management in written form. We say in effect, "This is the kind of person that you agree makes a good supervisor, and these are the things that he does that make him good. Please review this report and assure yourself that it contains what you meant to convey to us."

After the analysis has been reviewed and if necessary revised, we try to determine the best way to predict how a potential foreman would stand on each of the important areas that differentiate good from poor supervisors. We have long since learned two things: (1) There is no single test, method or technique that will do the whole job; and (2) Even the soundest approach falls short of perfection. By using a systematic, organized and comprehensive approach with competent professional guidance, errors in supervisory selection can be substantially reduced. Techniques for the complete elimination of selection errors are years, if not generations, in the future.

The next step is to decide which of the important attributes can be predicted with a usable degree of accuracy and by what means. The prediction tools available are quite varied, serve different functions, and need to be selected carefully. Useful information concerning background, special training, education, experience and work history can frequently be obtained from a properly designed Personal History Form. The company's personnel records, if provision is made for recording the appropriate information, supplies another source. Periodic performance evaluations, if created for this purpose and properly executed, add to the picture. Sometimes especially designed proficiency tests may be useful. For other predictions, ordinary psychological tests of aptitude, personality, and attitude can be valuable. Clinical tests of the projective type constitute a relatively new device that are proving to be rather powerful tools in this area. Carefully conducted interviews by trained personnel in the company can add much, as can professional assessment, on occasion, by qualified outside consultants.

Even with as comprehensive a selection plan as we have described

. . . Continued on Page 58

Punch PRINTED CIRCUITS Cold...

with WALES Fabricator-Duplicator

The WALES **Fabricator** combined with WALES positive **Duplicator** is the modern, low cost answer to printed circuit hole punching. You get holes with sharp definition, clean walls and minimum bell mouth. This equipment is perfect for short runs from one piece to thousands. Change dies for hole sizes in seconds with a range up to 3½" dia. Accuracy is automatic and positive. Make your own templates, too, on the Fabricator. No need for drilling machines or jig-borers. The WALES Fabricator-Duplicator is a complete punching shop in itself.

SEND FOR BULLETIN NO. 27G

Complete specifications and capacities are yours for the asking.

WALES Strippit COMPANY

A UNIT OF HOUDAILLE INDUSTRIES, INC.

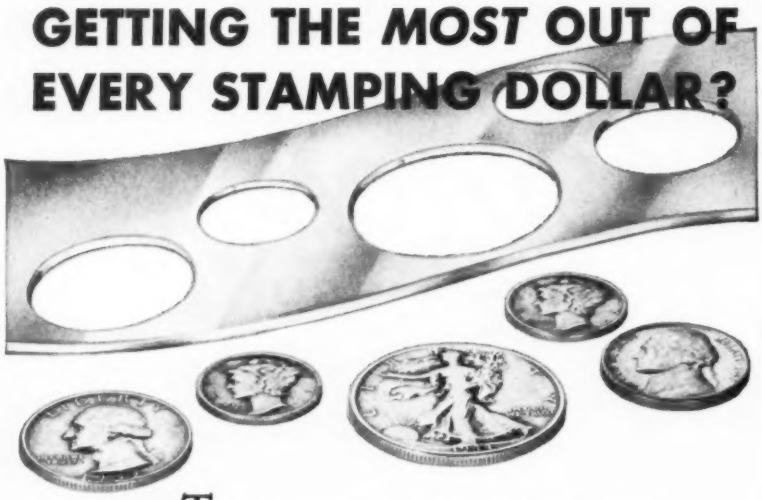
AKRON, NEW YORK

WALES-STRIPPIT OF CALIF., SOUTH GATE, CALIF.
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

"...the Wales-Way is the PLUS-PROFIT way"

CIRCLE INFORM-A-GRAM KEY NO. 57

ARE YOU SURE YOU'RE GETTING THE *MOST* OUT OF EVERY STAMPING DOLLAR?



THERE'S a way you can be sure, if you'll apply a few simple questions to your own operation. Are you getting the best quality, delivery, accuracy you can expect? Are your tools lasting long enough? Is tool storage overhead eating up the profits? Are you faced with too much idle press time?

These things can mean you'd be better off by buying your stampings from a high quality outside source like Laystrom. You get better stampings from Laystrom, faster, and with less headaches. Our technical men work with stampings all the time. It's our specialty. Our years of experience assure you that your stamping problems will be solved in the most economical way. We take advantage of all possible opportunities to do every job with the fewest possible steps, creating savings in labor and material *which are passed on to you in the form of lower unit costs.*

On your next job, let us know your requirements and figure on them. You may be surprised at the savings and benefits we can offer you. Send your drawings today!

LAYSTROM MANUFACTURING COMPANY
2005 North Parkside • Chicago 39, Illinois

● **Please send us complete brochure covering Laystrom production services to industry.**

Name_____

Title_____

Company_____

Address_____

City_____ **State**_____

☐ **We are sending drawings for quotation.**
☐ **Have salesman call.**
☐ **Send brochure only.**

LAYSTROM
TOOLS • DIES • ASSEMBLIES • PARTS DESIGN • SHORT-RUN DUPLICATING
Manufacturers of the Layco Tru-Align Die Setup

CIRCLE INFORM-A-GRAM KEY NO. 58

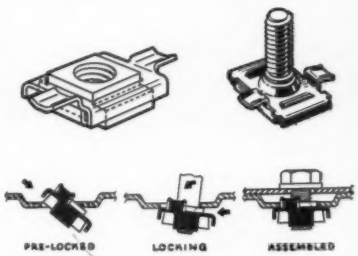
. . . Deficiency from page 56

above, it is not possible to cover every aspect of the supervisor's job. But by examining it carefully, you can identify what you hope to predict and be aware of what is not feasible to predict. You are then better able to invest your time and effort on what is most important. You will not have completely licked the problem of evaluation deficiency, but you will have confined your deficiencies to the least important areas and employer your evaluation resources in a way that will do the company the most good.

NEW FASTENERS SPEED INSTALLING ASSEMBLIES IN HARD-TO-REACH PLACES

Two entirely new fasteners have been designed primarily for automotive front fender application. These self-retaining speed grips eliminate costly welding and staking operations and permit ready installation where assemblies are not easily accessible.

One of the new front-mounting fasteners is a nut-retainer (upper left on photo) which is easily drifted into locked, bolt-receiving position with a simple tool. Affording ample float



to offset normal manufacturing tolerances, the fastener also provides excellent "pullout" resistance. Applied after painting, the new nut-retaining speed grips eliminate the possibility of weld flash damage and time-consuming retapping of stripped or paint-clogged threads.

Counterpart to the new nut-retainer developed by Tinnerman Products, Inc. is a fastener which retains a rigidly fixed bolt (upper right on photo). It operates on the same basic principle as the nut-retainer, and the bolt itself can serve as the drifting device. Simply tipped into a mounting hole from the front side, the new bolt-retainer locks itself firmly in place as it is drifted into perpendicular position.

Both of the new Tinnerman speed grip fasteners are fabricated in wide range of screw and nut sizes and panel thicknesses.

The Revolutionary, New

Multi-Max punch press

speeds from 40 to 1000 strokes per minute

A machine with an amazing versatility of use, as these additional features suggest:

Bolster and ram areas from 2 ft. x 2 ft. to 4 ft. x 12 ft.

Unlimited shut die height

Material may be fed from front to back, back to front or side to side

You may well have an application for the Multi-Max that can speed your production and reduce overhead. Cost of the machine itself is remarkably low.

Our Engineering Department will gladly work with you on any specific questions you may have.

Send for Bulletin 40 giving a complete run down on all features and specifications—address Dept. TP-8

Diamond Machine Tool Corp.
5111 Coffman-Pico Road, Pico, California

CIRCLE INFORM-A-GRAM KEY NO. 59

40 STYLES—OVER 200 TOOLS—

MAKE KENDEX* TOOLING ADAPTABLE

for virtually every machining job

The production-boosting, cost-cutting, job-simplifying advantages offered by the Kendex throw-away, turn-over insert principle can be adapted to practically any machining job.

Over 40 styles and over 200 Kendex tools let you make savings in boring; profiling; chamfering; odd job, step and face milling . . . on older machines as well as on the newer automatic cycling types.

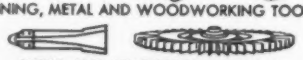
Kendex tools permit quick changing of inserts without resetting the tool, eliminate costly insert and chip-breaker grinding, give better chip control, permit use of harder grades like Kennametal K7H along with many other grades in inserts of various sizes and shapes to give best results on any specific job. Many of the tool styles offer a choice of positive or negative rake which accommodate either regular or precision ground inserts. Kendex offers the most advanced and complete line of metalworking tools available today.

The pictures above merely suggest the many tools in which the Kendex principle is available. Your Kennametal Tool Engineer will help you apply Kendex tools to your operations. He works exclusively with Kennametal tooling . . . applying and servicing it . . . working with production men in mapping the best solutions to tough machining problems. Give him a call or write KENNAMETAL INC., Latrobe, Pennsylvania.

*Trademark

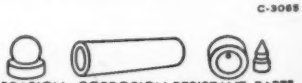
C-3065

MINING, METAL AND WOODWORKING TOOLS



WEAR AND HEAT-RESISTANT PARTS

INDUSTRY AND
KENNAMETAL
. . . Partners in Progress



ABRASION, CORROSION-RESISTANT PARTS

PERCUSSION AND IMPACT PARTS

CIRCLE INFORM-A-GRAM KEY NO. 60

"Commendable Comments"

"With—for example—$7 billions being spent this year on research and development, the consequences are inevitable. Most manufactured products now on the market must expect to be pre-empted by others. Almost every company is sitting on a powder keg of new product competition. Not even the most successful companies can afford to relax, or be complacent. This new product race is endless. Many products introduced only a few years are becoming profitless."

—Dr. C. Wilson Randle, partner of Booz, Allen & Hamilton, at the National Industrial Advertisers Association Conference.

"... from the standpoint of communications, getting the facts is only the first step. Information alone is of no more use than iron ore in the ground. It must be refined and shaped into forms useful to the audience."

—C. M. White, chairman, Republic Steel Corp., at the General Meeting of the American Iron & Steel Institute.

"The matter of competition between groups cannot be overlooked in any attempts to increase efficiency. We firmly believe in the old fashioned, but psychologically sound, idea that most men take pride in their work and no man wants to be at the bottom of any comparative list. The effect of [reliable information, skillfully presented] is to stimulate self-competition and to give the worker means to regulate his own output within limits he considers acceptable."

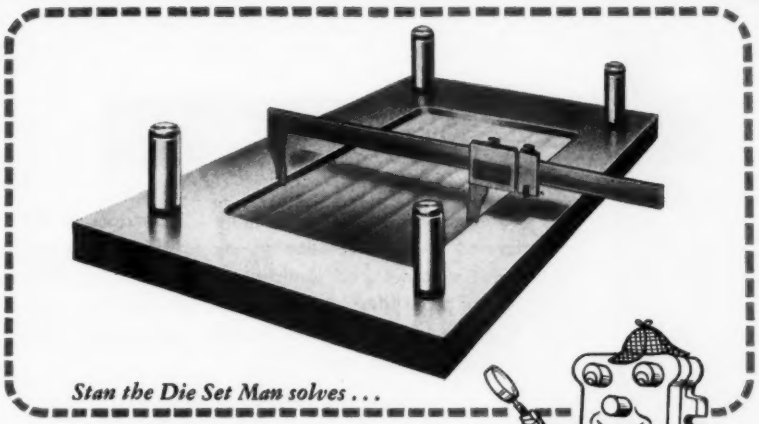
—Walter T. Hayter, process control metallurgist, The Youngstown Sheet & Tube Co., at the General Meeting of the American Iron & Steel Institute.

"... there is no force as deadly to an established business as industrial research. Nothing can destroy a business so completely and irrevocably as a new and better product in the hands of a competitor."

—J. Earl Gulick, vice president of manufacturing, B. F. Goodrich Tire Co., at the annual meeting of the Ravenna, Ohio, Chamber of Commerce.

"Long Range Planning demands a look ahead of at least five years; a shorter view quickly becomes entangled in current operating problems, and a longer one grows pretty hazy and impractical. ... LRP is not a one-shot deal, nor a project undertaken only at set intervals."

—from the Acme Reporter, official publication of Association of Consulting Management Engineers, Inc.



Stan the Die Set Man solves ...

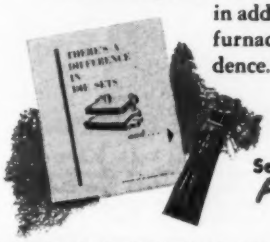
THE
CRAZY CASE
OF THE
DRIFTING DIMENSIONS

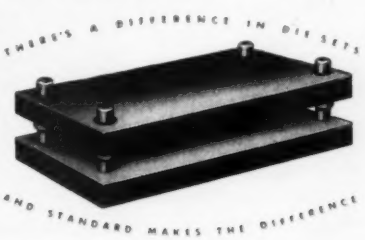
CASE HISTORY: Expert diemaker accurately mills pocket in which to mount blanking die. Next morning, finds die does not fit pocket. Rechecks pocket with vernier calipers and finds dimensions have mysteriously drifted! Finds, too, that posts bind in bushings when he tries to reassemble die set. Result: diemaker almost loses mind ... loses time and money, too!

SOLUTION: Diemaker calls Standard Die Set Engineer. (Smart move!) Learns that instability of steel in ordinary die sets often results in drifting dimensions. Learns, too, that Standard gets around this problem by *stress relieving* all punch and die holders. Meaning they are slowly heated to 1550° F.... soaked at this temperature for 3 hours ... then gradually cooled to room temperature. This removes residual stresses ... assures that dimensions "stay put" ... provides absolute parallelism of working surfaces.

BEST OF ALL, Standard Stress-Relieved Die Sets are yours at prices competitive with ordinary die sets. Worth looking into!

SO HELPFUL is this service to tool and diemakers, Standard has now installed large annealing furnaces in Philadelphia and Indianapolis, in addition to the furnace at Providence.





Send for this Die Set Comparison Chart and ***FREE*** tube of Standard Diemakers Grease!

MAIL THIS COUPON NOW

STANDARD DIE SET MFRS., INC.
1501 Elmwood Avenue
Providence 7, R. I

☐ Please send comparison chart
☐ Yes, I would like sample tube of grease

Name.....
Company.....
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New York • Philadelphia • Buffalo • Detroit • Grand Rapids • Indianapolis • Louisville

CIRCLE INFORM-A-GRAM KEY NO. 61

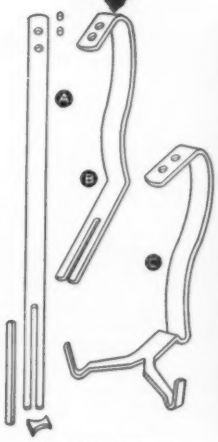
top performance IN MASS PRODUCTION

60 vaporizer stands per minute . . . automatically formed in one operation on an A. H. Nilson combination press and 4-slide. Kaz Vaporizer stands are a proof that clever product design, combined with precision tooling by Nilson, increases production and lowers costs.

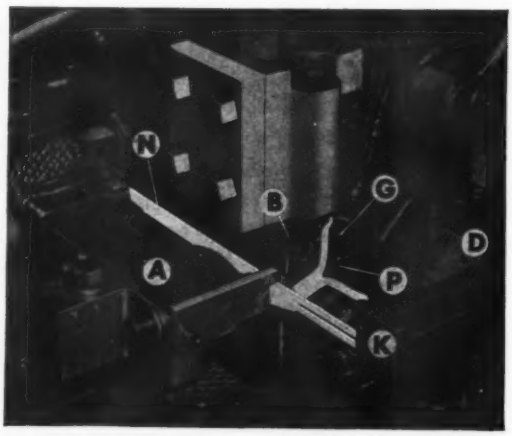
NILSON 4-SLIDES FEATURE—

- ONE-MAN OPERATION
- FORMING OF WIRE OR RIBBON METALS FROM THE COIL
- ONE FAST, AUTOMATIC OPERATION WHICH STRAIGHTENS, FEEDS, PIERCES, BLANKS, SWAGES, STAMPS OR COINS, CUTS OFF, FORMS
- CRITICAL TOLERANCES UP TO .002 ON ANY RUNS
- FAST TOOL AND DIE CHANGING
- WIDE SIZE RANGE—FORMS WIRE UP TO ½ IN. DIA. IN FEEDS TO 32 IN. MAX. AND RIBBON STOCK UP TO 3½ IN. WIDE
- PRESS SECTIONS—5 TO 30 TON CAP.
- HEAVY DUTY MODELS—50 AND 75 TON CAP.

Without obligation, Nilson provides specific forming recommendations from detailed information. Send for A. H. Nilson catalogue . . . the first step to increased production.



Stand is zinc-plated steel strip 0.05 in. thick by 0.625 in. wide . . . made in steps A, B and C.



Final step in forming Kaz stands on Nilson 4-slide. Feet are spread, bent, crimped (G) with workpiece (P) on centerpost while next piece (N) is being cut off. Stop (K) on right slide (D) backs off after cut and workpiece (P) is wrapped around centerpost by die (A) when finished part is clear.

THE A. H. NILSON MACHINE CO.
1522 Bridgeport Ave., Shelton, Conn.

NILSON

CIRCLE INFORM-A-GRAM KEY NO. 62

Paul A. Bisnette, a new field engineer for Norton Co., has been assigned to the Los Angeles district office.

◆

The appointment of **James A. Arney** as division manager for southern Indiana and western Kentucky has been announced by The Aro Equipment Corp. His headquarters will be in Indianapolis.

◆

Frank M. Mansfield III has been named sales manager and vice president of Wagner Brothers, Inc. His new duties will include directing the company's field sales force and distributors. He formerly was with the Metallurgical Products Department of General Electric Co.

◆

Robert W. Kyle has taken over as service engineer for Anocut Engineering Co. Covering the New England, New York, and Philadelphia areas, he will be in charge of installing and servicing the company's electronic - electrolytic grinding equipment.

◆

Charles J. Lyons has joined the sales staff of Hy-Pro Tool Co. He will serve as direct factory representative in the New York, New Jersey area.

◆

The new representative in Indiana and Kentucky for the S.W. Card Division of Union Twist Drill Co. is **Ladd F. Burkhardt.** He will give technical aid in the selection and use of Card taps, gages, and other products.

◆

Verson Allsteel Press Co. has disclosed the appointment of **Robert W. Hoefler** as assistant sales manager. He has been associated with the company since 1950.

◆

The new sales manager of Van Products Co. is **Dana B. Griffin.** He has a background of 12 years of experience in compressed air applications and pneumatic sales.

◆

Scovill Mfg. Co. has announced the appointment of **S. O. Drivdahl** as regional sales manager of the General Manufacturing, and the Forging and Screw Machine Divisions. He will have administrative supervision of all manufacturing sales personnel in the Rochester, Cleveland, Pittsburgh, and Philadelphia districts.

In laboratories...and in tooling

Filing problems of researchers building experimental apparatus are solved by one of 6000 different Nicholson or Black Diamond files.

Nicholson and Black Diamond files have uniformity of construction and stamina needed in high-speed tooling.

There's a Nicholson or Black Diamond file for every purpose

In laboratories where researchers explore for new products and methods, there's frequent need for files.

Working with a wide range of materials, often intricate shapes and many sizes, research men shape experimental apparatus and models of their projects.

Whatever the material or the filing problem, there is a Nicholson or Black Diamond file for the job. X.F. (*EX*tra *F*ine) Swiss Pattern files for fine work, Stainless Steel, Aluminum and Brass files for specific materials—files for fast cutting, for deburring, for finishing . . . for *every* filing job.

When an idea passes the development stage and goes into production, quality Nicholson-made files help workers file quickly and well. Combination of right file and filing method keeps costs down.

• • •

In laboratories, in tooling and on production lines, wherever you do filing, there's a Nicholson or Black Diamond file for the job. You can depend on 12 perfect files in every dozen. Available at your Industrial Distributor's, who maintains full stocks to give you fast delivery.

NICHOLSON U.S.A. **NICHOLSON FILE COMPANY, 27 ACORN ST., PROVIDENCE, RHODE ISLAND** BLACK DIAMOND U.S.A.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

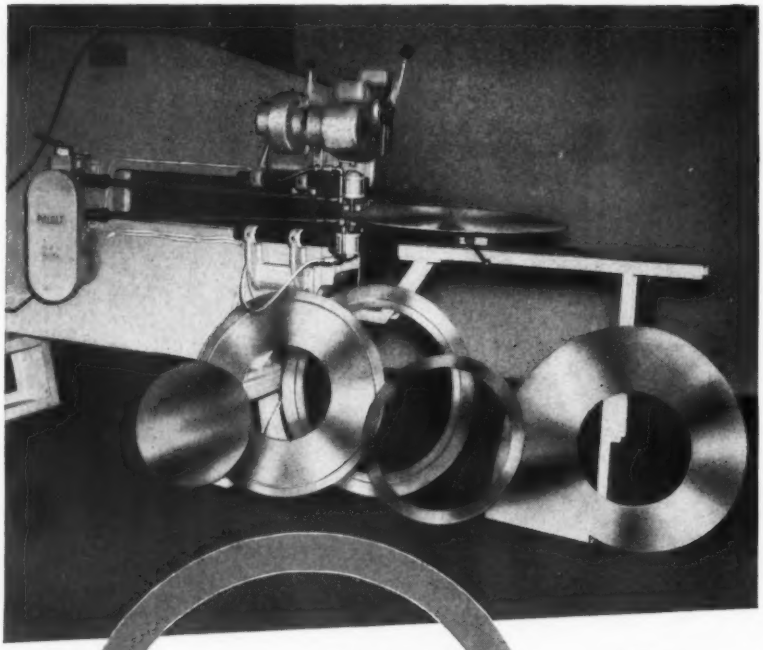
NICHOLSON and BLACK DIAMOND FILES

WORLD'S FOREMOST MANUFACTURER OF FILES FOR EVERY PURPOSE

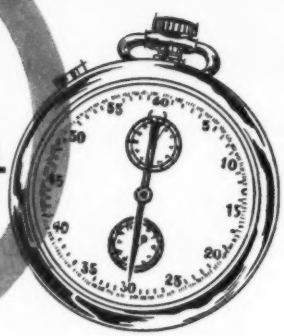
CIRCLE INFORM-A-GRAM KEY NO. 63

PULLMAX-First in Circle Cutting

Less Weight • Less Floor Space • Twice the Speed • Half the Cost!



PULLMAX
cuts 36" circles
in 3/8" MILD STEEL
in 30 seconds



With the amazing PULLMAX Heavy Duty machines, you can cut circles to practically unlimited sizes with the utmost accuracy.

With the power feed and outside attachment PULLMAX has proved itself the fastest, most modern and accurate ring and circle shear.

A PULLMAX Machine with a power feed that operates at various speeds up to 32 lineal feet per minute and a simple outside attachment is an investment of roughly ½ the cost of other ring and circle shears.

and the same Pullmax machine also does:

straight shearing • irregular cutting • louver cutting • dishing joggling • slot cutting • beading

Write for literature and prices today.

We'll be glad to send the Pullmax Mobile Demonstrator to your plant—just write or call.

AMERICAN PULLMAX COMPANY INC.
2469 North Sheffield Avenue • Chicago 41, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 64

GROWING PAINS

Construction to total $250,000 in enlarged and modernized office facilities has been started by **The National Acme Company.** When completed in October, 9,000 sq ft of new area will have been added to the main office.

◆

The Dake Corporation will build a new plant near Grand Haven, Mich. Cost of the new structure is estimated at more than $500,000. There will be 45,000 sq ft of shop space and 5,600 ft of office area. The corporation specializes in the manufacture of hydraulic, utility, and arbor presses.

◆

Expansion of production facilities of **Datamatic Corporation** has been disclosed. The firm has acquired an additional 75,000 sq ft of factory space to enlarge production of large scale electronic data-processing systems. The addition of the new space, the third major expansion for the two-year-old company, brings its total plant area to 130,000 sq ft. Occupancy of these facilities is set for late summer.

◆

A one-story building is being constructed to provide additional facilities for special refractories at **Electro Refractories and Abrasives Corporation.**

◆

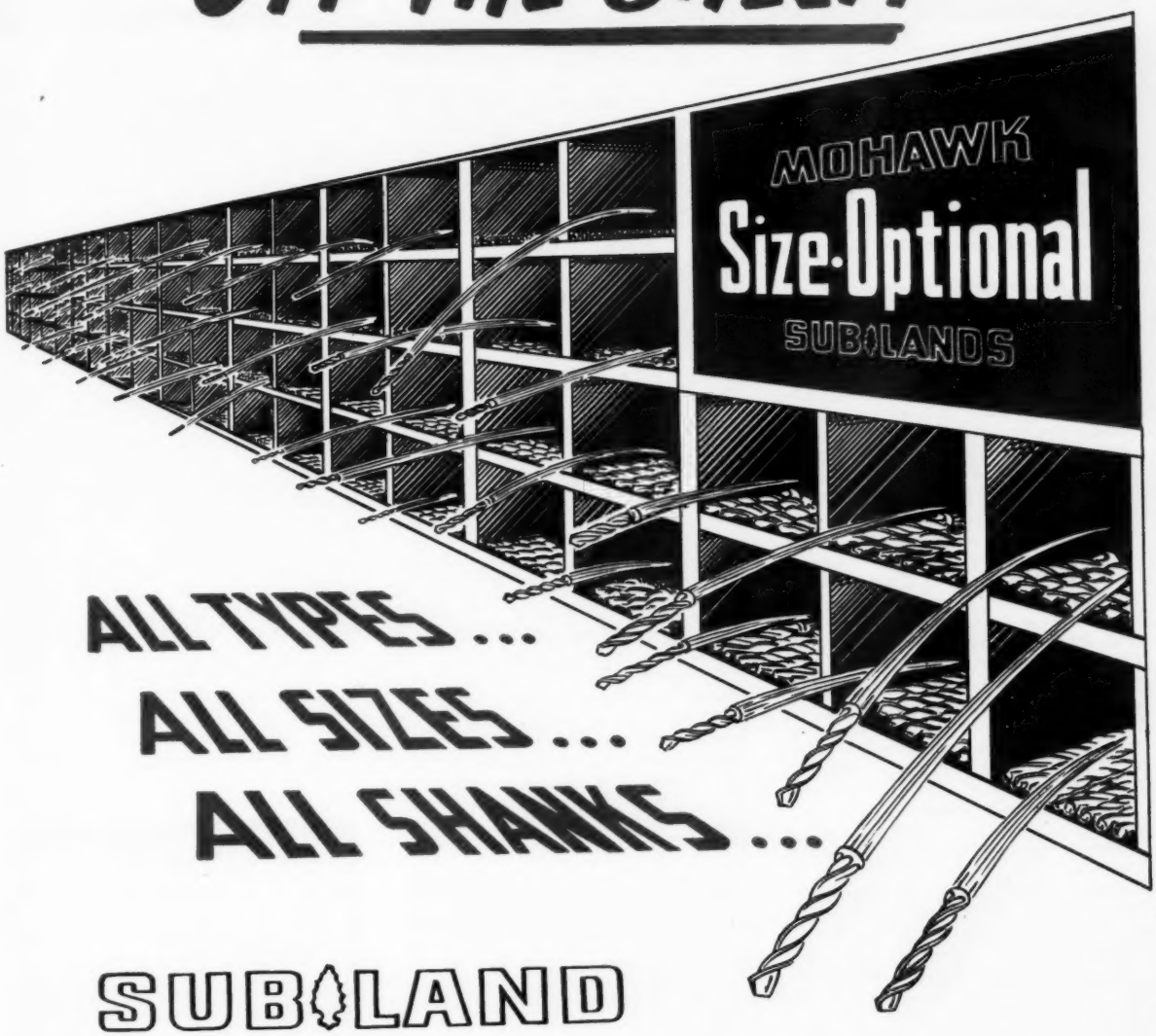
Plans for a multi-million dollar expansion of the manufacturing and engineering facilities of **Weston Hydraulics, Limited,** aircraft component subsidiary of **Borg-Warner Corporation,** have begun with the purchase of approximately 32 acres of land in Van Nuys, Calif. A 75,000-sq-ft building for the development and production of hydraulic and pneumatic equipment for aircraft, missiles, and rockets is being erected. Due to manufacturing increases, other Borg-Warner divisions and subsidiaries may build facilities on the Van Nuys site.

◆

A new $6.5-million plant for the manufacture of grinding wheels will be built by **Norton Company.** When completed in 1959, Plant 8 will contain modern facilities for making organic bonded grinding wheels. This plant has been designed for straight line production of wheels up to 30" in dia.

SUBLANDS

OFF THE SHELF!



ALL TYPES ...
ALL SIZES ...
ALL SHANKS ...

SUBLAND

- DRILL CHAMFER
- DRILL COUNTERBORE
- DRILL REAMER
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Delivery in Ten Days

WRITE FOR COMPLETE CATALOG

Mohawk TOOLS, Inc.

910 E. MAIN ST., MONTPELIER, OHIO

world's largest producer of Sublands

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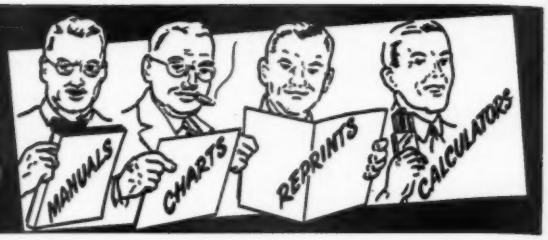
SHOP AIDS



"The Facts of Life" on Air and Hydraulic Devices are given in a revised edition of a booklet prepared by Logansport Machine Co., Inc., Logansport, Ind. It outlines how to proceed in installing hydraulic and pneumatic systems, and tells what to look for if the system fails to function properly.
Circle Inform-A-Gram No. C1.

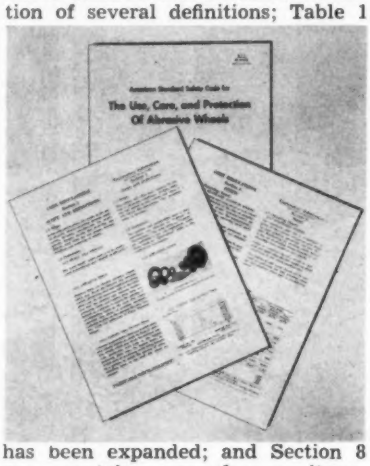
The Electrolizing Process, which deposits a hard, dense, non-magnetic alloy for increasing wear parts life, is described in a 24-page booklet. Explained is how electrolizing overcomes friction, wear, abrasion, galling, and corrosion problems; and increases mechanical reliability. Direct requests for copies of the Electrolizing Booklet to The Electrolizing Corp., 1505 East End Ave., Chicago Heights, Ill., or —
Circle Inform-A-Gram No. C2.

"Wear Resistance of Chromallized Iron and Steel" describes a process for diffusing chromium into medium and high carbon steels to form Chromacarb Case. Dimensional control, surface finish, and heat treating procedures are described; and case histories and typical applications presented. Get the four-page folder from Chromalloy Corp., 450 Tarytown Rd., White Plains, N. Y., or —
Circle Inform-A-Gram No. C3.

Handy Alumibraze is detailed in Bulletin 23 prepared by Handy & Harman, 82 Fulton St., New York 38. The bulletin gives step-by-step details on dip brazing with the powdered aluminum-silicon alloy, which is applied as paste. Also described are design techniques, fixturing arrangements, and salt-bath requirements to produce strong, dependable joints in various aluminum alloys.
Circle Inform-A-Gram No. C4.

A Blue Technical Data Sheet on a Special Stainless Steel for jet engine parts, high pressure steam valves, and steam and gas turbine parts is now being distributed by Allegheny Ludlum Steel Corp., Advertising Dept., Oliver Bldg., Pittsburgh 22. Detailed in the data sheet is stainless steel Type 418 Special, which is recommended for application in the 750° to 1100°F range. Included are physical and mechanical properties, and resistance to corrosion and oxidation.
Circle Inform-A-Gram No. C5.

A Revised Abrasive Wheel Safety Code has been issued by Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15. It covers the use, care and protection of abrasive wheels. Among the changes are the rearrangement of Section 1 to facilitate the location of material and the addition of several definitions; Table 1



has been expanded; and Section 8 now contains several new items, among these are separate tables for standard and special maximum speeds. In addition, Section 10 has been changed to insure correct application of this class product. For your copy of the revised safety code, contact the Institute, or —
Circle Inform-A-Gram No. C6.

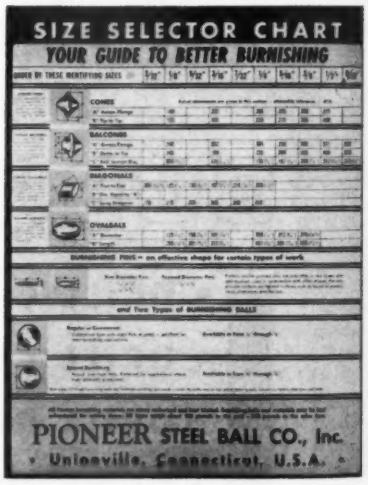
Preventive Maintenance for Industrial Trucks is highlighted in the first issue of a new quarterly external house organ, "The Elpar Lift for Industry," published by Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3. Included are actual work charts, which can be used for such programs. The issue also contains a series of picture stories describing how specific handling problems have been solved.
Circle Inform-A-Gram No. C7.

A Complete Product Designer's Kit has been made available by Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N. Y. It points out the possibilities for cost reduction in small parts components through the use of tiny precision die castings and thermoplastic moldings. The kit details the company's methods for low-cost automatic production of small parts in volume. Direct requests for the kit to the company, or—**Circle Inform-A-Gram No. C8.**

A Performance Report on Two Titanium Bolt Alloys has been published by Standard Pressed Steel Co., Box 600, Jenkintown, Pa. The report contains data on tensile, shear, and fatigue strength tests of titanium threaded fasteners at temperatures ranging from room temperature to 600°F. Fasteners tested were made from titanium alloys 4A1-4Mn and 6A1-4V. The study states no conclusions, but provides sufficient data to indicate obvious trends. Contact the company for copies of the report, or —**Circle Inform-A-Gram No. C9.**

A Functional Description of Numerical Positioning Control is given in Bulletin GET-2675 from General Electric Co., Schenectady 5, N. Y. The 14-page bulletin gives a detailed breakdown of the three major elements — data input, director, and servo drive. In addition, the features are listed and each operation graphically illustrated. Get your copy from the company, or —
Circle Inform-A-Gram No. C10.

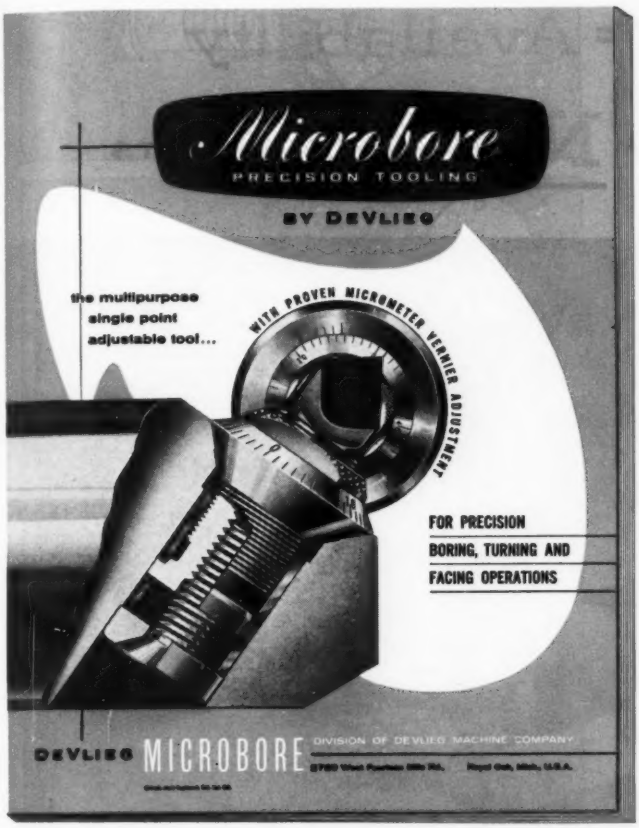
This Wall Chart, "Your Guide to Better Burnishing," is now being offered by Pioneer Steel Ball Co., Inc., Unionville, Conn. Burnishing cones, balcones, diagonals, ovalbals, and pins are illustrated and the available sizes in each of these items



are listed. The chart also indicates actual dimensions of these metallic burnishing materials. The chart facilitates selection of the sizes and shapes best suited for use on parts requiring a ball burnished finish.
Circle Inform-A-Gram No. C11.

now a completely new DeVlieg Microbore Catalog

listing 332 standard general purpose boring bars

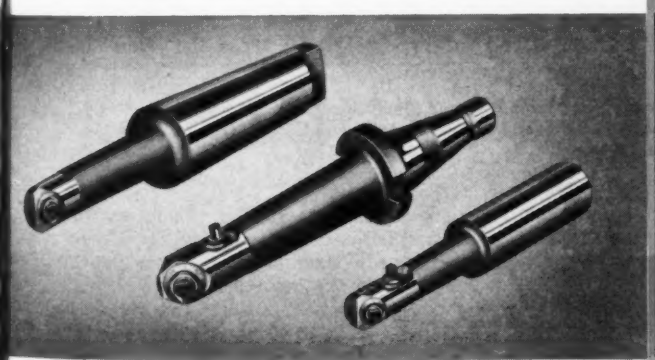


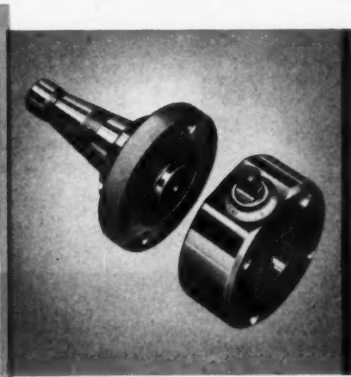
. . . FOR USE ON ALL MAKES AND TYPES OF BORING MACHINES, MILLING MACHINES AND TURRET LATHES!

Yes sir, you'll find it a constant aid. The new descriptive Microbore Catalog No. 58 presents a comprehensive range of newly designed Standard Single Tool and Two Tool Boring Bars, Boring Bar Sets and accessories. It also includes complete application, dimensional and carbide data.

Unique flip charts with simple engineering illustrations make it fast and easy to select the correct Boring Bar with NMTB Taper, Morse Taper or Straight Shank for a specific application.

STANDARD MICROBORE BORING BARS, BORING RINGS AND BORING RING ADAPTERS ARE AVAILABLE SINGLY OR IN SETS





MAIL THIS COUPON TODAY

DeVlieg Microbore

DIVISION OF DEVLIEG MACHINE COMPANY
2720 West Fourteen Mile Rd., Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 67

Please send me a copy of your new Microbore Catalog No. 58.

Name _____

Company _____

Title _____

Address _____

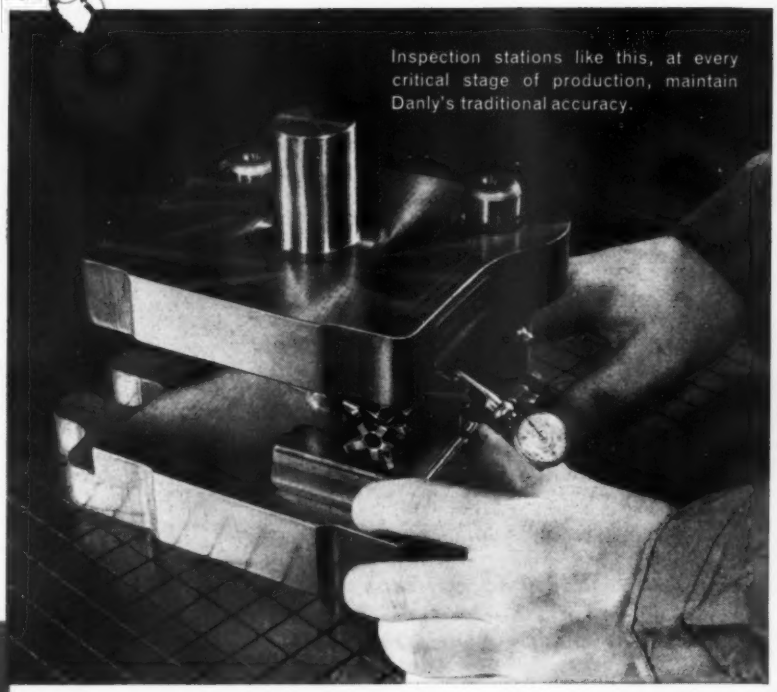
City _____ Zone _____ State _____

TP

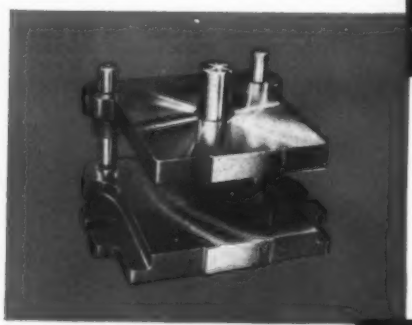
Precision+ Interchangeability = Availability

ON **NEW** DANLY DIE SETS

Danly leadership in die set distribution is made possible by the precision with which Danly sets are made. Precision makes Danly die set components completely interchangeable . . . parts can be stocked by branch assembly plants or distributors throughout the country and assembled for delivery in any of thousands of combinations as standard die sets to meet specific tooling needs. No matter where you are, from New England to California, you get the same Danly precision, the same broad selection, the same fast service.



Inspection stations like this, at every critical stage of production, maintain Danly's traditional accuracy.



Leading industrial distributors and Danly branch assembly plants—located in all major tooling centers—stock Danly Die Sets for fast delivery.

DANLY MACHINE SPECIALTIES, INC.

DANLY

DEPT. E
2100 South Laramie Avenue
Chicago 50, Illinois

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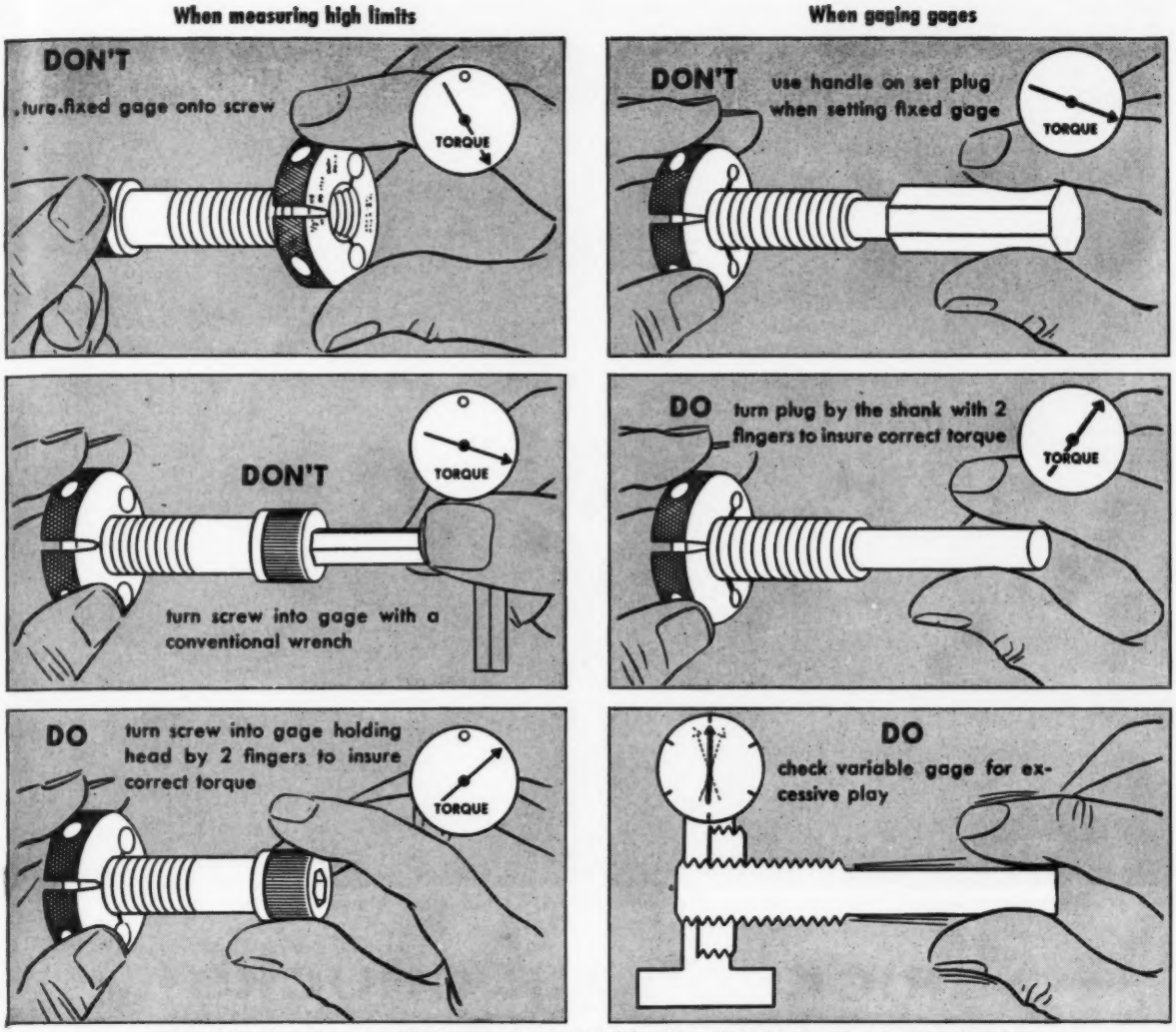


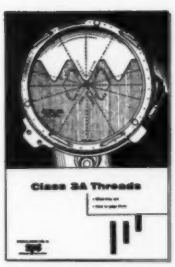
These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard UNBRAKO socket screw products fall within specified tolerance limits *no matter what method is used to gage them.* Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 36, Pa.



We also manufacture precision titanium fasteners. **Write for free booklet.**

Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

STANDARD PRESSED STEEL CO.

UNBRAKO® **SOCKET SCREW DIVISION** SPS

JENKINTOWN ■ PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 69

Photo: *Courtesy Harris Calorific Company, Cleveland, oldest and largest independent producer of gas welding and cutting equipment in the country.*

ERICKSON AIR CHUCKS

a hot tip for cutting costs on cutting-torch tips

Erickson '09 Model Air Chuck for heavy work. Quick-acting air chuck, with leverage principle, gives 3 to 4 times holding power of ordinary chucks.

"We have used Erickson Chucks since 1942 . . . and would recommend Ericksons to any plant which wants to increase production . . ." That is the report from Harris Calorific Company, big-name manufacturer of gas cutting and welding equipment.

The company uses four No. 400 Erickson Air Chucks for finishing leaded copper cutting-torch tips. Operations consist of drilling, reaming and polishing—at the rate of approximately *100 pieces per hour per chuck*.

Compared to previous methods, Harris Calorific Company claims, trueing-up time has been cut 70% . . . chucking time 60% . . . set-up time 25%.

Let an Erickson representative show you how to cut your production costs—*accurately*—with Erickson Air Chucks.

AA-3709

Bothered by a tough holding problem? Then let us show you how Erickson holding tools speed production, lower costs. Call us or write for Catalog K.

ERICKSON TOOL COMPANY

2301 - 8 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS
FLOATING HOLDERS
TAP CHUCKS
TAP HOLDERS
AIR-OPERATED CHUCKS
EXPANDING MANDRELS
EXPANDING-COLLETS
SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 70

editorial:

Grown Down Automation

WE HAVE VISITED recently some automated production and assembly installations that bring to mind a few prophetic remarks made on this page in March 1953.

Under the title of "Automation to Grow Down" we said, "Ordinarily we think of things as growing up. As we speculate on the future of automation we are prone to think of it as growing down; down to smaller plants and smaller products. . .".

Further, we recognized that, "The development of automation has been spurred by the combination of several needs, i.e., the need to eliminate the application of direct labor to irksome tasks, to heavy and, consequently, hazardous handling operations, and the need to free labor for more highly productive jobs."

At that time the outstanding, pioneering automation accomplishments were found in the processing of automotive cylinder blocks and heads; admittedly heavy and cumbersome cast iron workpieces.

Today, thanks to advanced automation, there is not a human grunt or groan left in the entire building of an automobile engine — from foundry to test stand.

In the meantime, as predicted, automation has been "growing down" in a big way, and we now find automation applied to the product AND ASSEMBLY of components of but a few ounces in magnitude.

We saw many outstanding examples of this in a new Westinghouse plant in Upper Sandusky, Ohio, which is devoted to the manufacture of small, fractional horsepower motors.

Throughout the plant, the old tote pan technique is conspicuous by its absence — all parts are kept on the move.

Between and from the punch presses, rotor and stator laminations are kept moving: on magnetic belts, via tube-type feed hoppers, and overhead conveyors. Automatic stacking machines ready the stators for their automatically wound coils, and the rotors for their shot of die cast metal.

Many automatic gaging, annealing, spraying and baking operations are performed "en transit" to final assembly.

Motor end bells (pocket-sized workpieces) are produced on a 10-station automatic transfer press and then start their conveyorized ride through automatic washing and drying for removal of die compound, next a phosphate coating for rust prevention and paint adhesion, and then final painting and drying.

Assembly of the motor end bell — all very small parts — is highly automated by a special wicking, bearing assembly, and oiling machine. This consists of a hydraulic press, a 12-station indexing table, automatic oil tube positioner, two oil measuring and filling stations, and a bearing cap orienting and inserting device.

The parts are manually positioned; automatically oiled, assembled, and transferred to the grommet inserting and bearing cap staking machines, and then start their journey along the final assembly conveyor.

The philosophy of these latest production and assembly techniques can well be: moving parts gather no moss! — nor do they engender profit-absorbing inventories of work-in-process.

Another outstanding example of small parts automation was seen in Ford Motor Company's new Sterling Plant just north of Detroit.

There, where chassis and running gear parts are produced along some 11 conveyorized miles of transfer machining, progressive stamping, automatic gaging and testing, we met up with today's ultimate in the automatic assembly of a multiplicity of small parts.

This was a machine automatically assembling the parts forming the upper arm of a ball-joint front suspension unit, thusly:

The basic parts are locked in a fixture which travels a circular track through 28 stations. Electrical controls and cam mechanisms direct the addition of 13 parts and inspect the completion of each operation.

The machine rivets; loads bushings, retainers, lock washers and screws; torques the screws; assembles cover, shield and seal; greases the ball joint; and applies a protective paper tube. If any defect is "noted" by one of nine automatic checking stations, a memory unit "is advised" and the partial assembly then moves through the remaining stations without further work.

There you have it. In 1953 we predicted "Automation to Grow Down." We rest our case.

E. Willard Pennington

editor

"Ten Times More Hits

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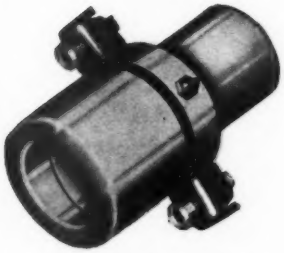

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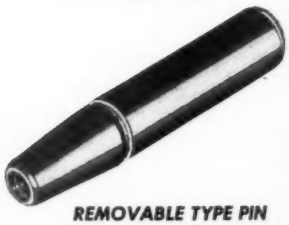

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TOOLING & PRODUCTION

GAGING TYPICAL STAMPING DETAILS

by William E. Hoffman
Associate Editor

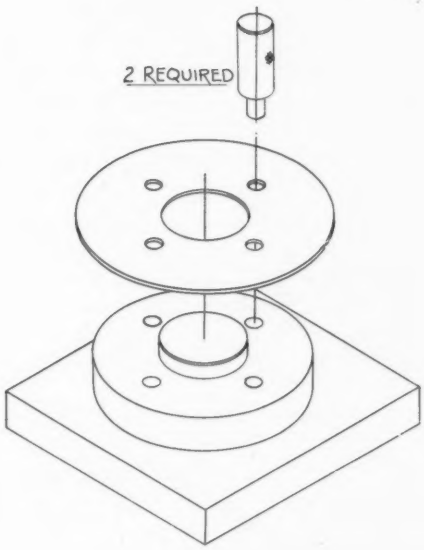
SUPPOSE YOU had everything the way you wanted it — steel exactly to specifications, equipment in top condition, dies made by the most skilled men, operators who knew just how to run the job, customers with a complete understanding of your problems and needs. Would you still need gages? Chances are that you would.

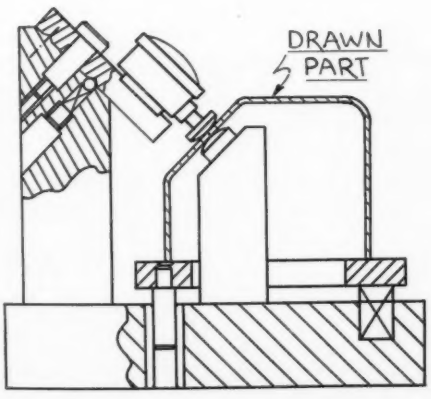
It is doubtful that such ideal conditions ever will exist, so the need for gages for checking stampings is extremely vital. The checking gages sketched below were explained in a "chalk talk" presented by the author at the Spring Technical Meeting of the Pressed Metal Institute, in conjunction with his address on "Gaging for Metal Stampers."

Concentricity and Hole Location

Some wheel plates, which are later bolted to axle housings, have identical hole sizes and locations but perhaps a different size central hole, so this checking fixture is not bolted together. The locator plug is piloted into the hole location disc, which in turn is piloted into the base. This way the proper combination of locator plug and hole location disc can be assembled onto the base to check the various wheel plates.

For hole location, two pins are used: One to locate the wheel plate radially; the other to check the position of the holes. To read concentricity, an indicator gage can be held against the plate periphery and the plate turned about the pilot plug.

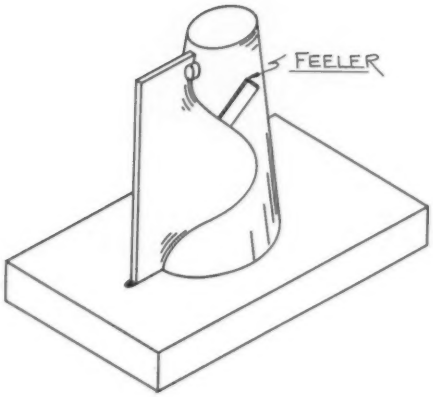




Metal Thickness

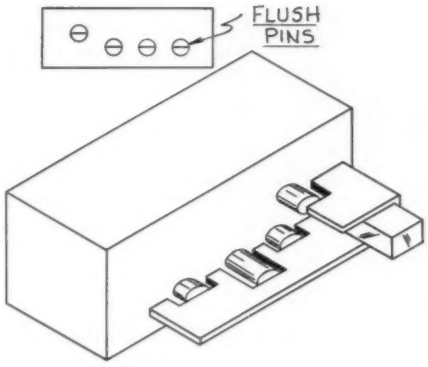
This relatively simple gage might be used in variation for checking metal thicknesses of a wide variety of deep drawn parts. For covering the greatest range of shapes, various horns as well as indicator buttons or prods can be used.

Omission of the pressure pad for squaring up the drawn cup, depending on the tolerances involved, is another variation of the gage. For the most part, drawn cups will have tolerances which can stand some tipping in a gage of this type before appreciable error will be found in the reading.



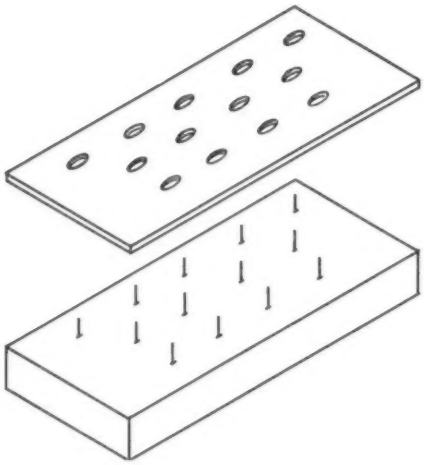
Odd Contours

For gaging an odd contour whose edge might have been generated about an easily reproducible geometric figure, the gage can be made of wood, plastic, or metal. This one is made of wood. A slot locates the sheet metal which falls around the configuration of the cone. A check of the contour in question can be made with feelers between it and the cone surface.



Stepped Surfaces

Where tolerances permit, flush pin gages can be used. The part being checked here, for instance, has various steps and surfaces in relation to each other. By locating the part over some type of mandrel, the stamper is able to bring flush pins into play, to be read from the other side.



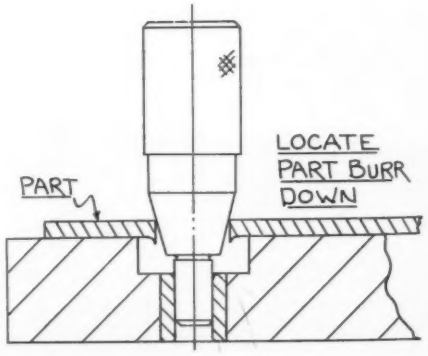
Multi-Hole Parts

To check whether all the holes are present in multi-hole parts, use a board with the proper number of nails placed where holes should be. If the part fits over all the nails, it has the correct number of holes. If all the holes are present, none of the punches are broken off.

A pin gage should be used occasionally to check hole size. More often, holding the part up to the light will show holes that are not satisfactory due to the use of a chipped punch.

Part Locating in Gages

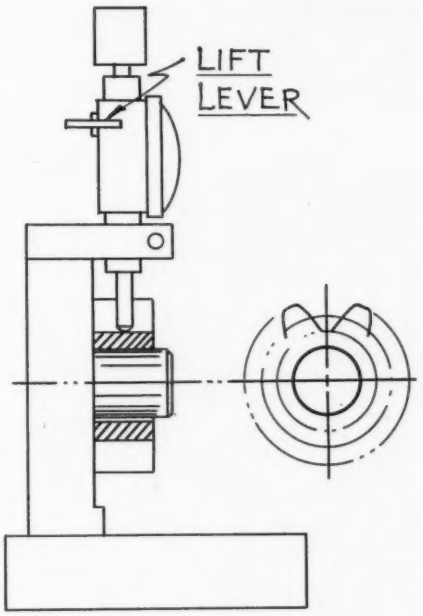
It is understandable that using tapered pins to locate a part in a gage where the tolerances are being checked to ten-thousandths is not feasible, but when working to thousandths, taper pins are valuable for locating parts in a gage. A slightly out of round hole condition or a non-uniform distribution of burr will make little difference and the gage will have a much better chance of telling a true story. At least, locating the part in the gage without sloppiness in the locating hole will be an advantage.

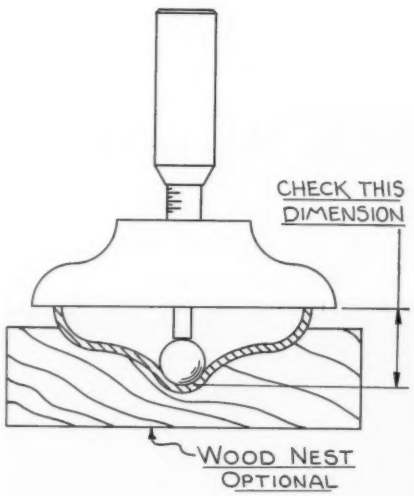


Gear Concentricity

Gears which have been rough stamped can be checked for concentricity on a horn. A retractable indicator can then be lowered to the gear and the inspector can continue checking each tooth with it. Gear thickness is shown here exaggerated.

Visual matching of production samples with those approved by the customer is one of the simplest gaging methods. For instance, where there are several draws in a cup, saw in half a production run part as well as a customer sample and match them up. Parts that are visually checked like this are usually not held to close tolerances.





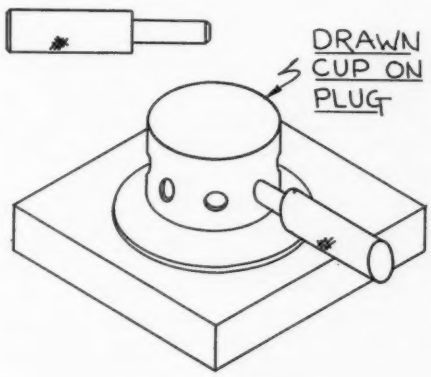
Contours

The drawn cup shown here has an important dimension from the face to the ball seat. To gage this, one can insert a ball in the cup, then use a depth "mike" to mike to the surface of the ball. The thickness of the ball is added to the reading.

Eyepiece micrometers (reticules) are handy gadgets. Use them to measure burrs, corner radii, notch depths, angles, and almost any other measurement which falls within their range.

Radial Holes

Radial holes in this cup are to be in a certain angular relationship to each other. A base with a central locating plug accepts the part, and two loose pins are then inserted through the holes in the part into the holes in the locating plug. One pin remains in place locating the part radially, while the other pin does the checking. Double end pins are not shown, but the other end of the pin could be used for checking hole size with the part out of the gage.



The author wishes to acknowledge the assistance of the following companies in the preparation of this presentation:

Parish Pressed Steel Division of Dana Corp.

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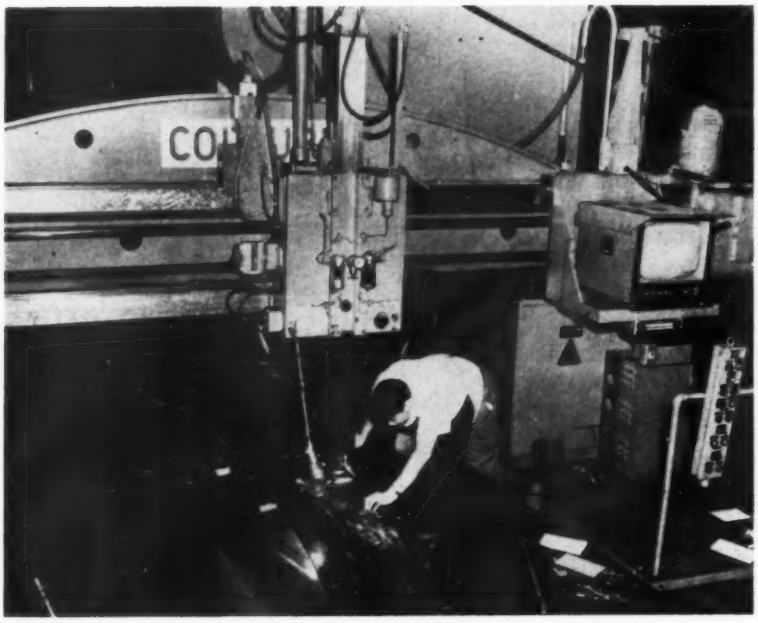
Worcester Pressed Steel Co.



Alcoa's die-layout machine has many applications, including laying out and checking templates used to hog out die blocks. Here a die block for a 50-ton die is in place, ready to be laid out by the machine.

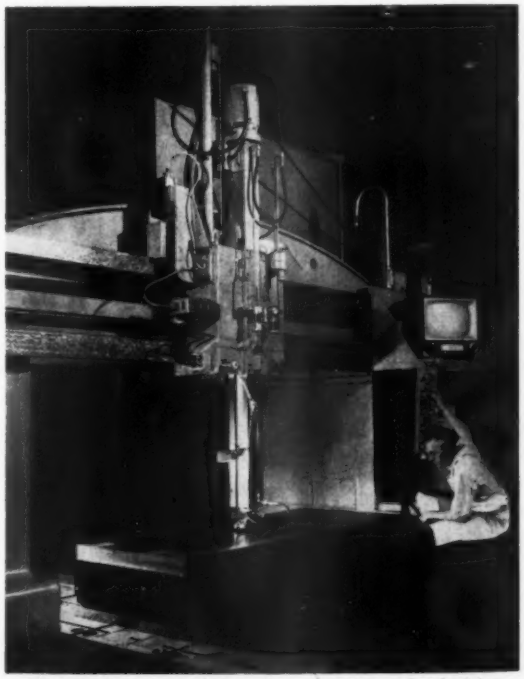
TV Important to Big, New Die-Layout Machine

THE HUGE DIES USED IN THE 35,000- and 50,000-ton forging presses in the Aluminum Corporation of America's Cleveland Works have outgrown the conventional straight-edge and divider layout methods and tools. Instead, the new die-layout machine developed by Alcoa and Consolidated Machine Tool Division of Farrel-Birmingham, Inc., handles layout tasks on dies up to 10′ x 22′ x 3′.

Television helps to lay out the dies with a degree of accuracy never before possible, Alcoa reports. A 17″ TV receiver on the die-layout machine's control platform flashes pictures of the finely calibrated verniers to the operator. With this, the operator checks the machine's position to a thousandth of an inch as it locates dimension points on a die block. The TV images are magnified 10 times. Selecting each of three channels in turn, the operator quickly spots the longitudinal, vertical, and transverse position of the scriber on the die block. Checking frequently, he precisely lays out lines which later guide a cutting tool during the actual die sinking.

Development of auxiliary tools such as pencil-type scribers, transit-type optical alignment telescopes, and vernier scribers for scribing large radii, Alcoa engineers believe, will increase the machine's value and versatility in the toolroom.

end



The die-layout machine takes advantage of television to achieve controlled accuracy in laying out forging dies.

Imagineering WITH CARBIDES

by Harold York
Design and Application Engineer
Metallurgical Products Department
GENERAL ELECTRIC COMPANY
Detroit, Michigan

The bi-carbide concept of cutting tool construction is explained by the author to the designer at the board.

Bi-Carbide Tool Construction Will Permit Effective Use of New Super-Hard Carbides With a Gain in Tool Life of 200 to 300%

WILL CEMENTED CARBIDES ever reach the point where tool life can be expected to be 200 to 300% greater than that being obtained today?

The answer to this question in the machining field is rather difficult to pinpoint at this time without a few more facts. But, with a little "imagineering", backed by a few preliminary test facts, the writer believes such a boost in tool life is possible.

From the beginning, growing machining needs and new alloys have placed the machinist on a constant lookout for new materials to improve his cutting tools. High speed steel was a great stride in the direction to provide tools that would cut faster and longer. Later came the cast alloys, then carbides, and now oxides are being explored.

With each advance, a new set of problems came up. Serious? — of course, at the time they were encountered. But the constant need for better tools stimulated action to overcome the problems so that each new tool material could be used most effectively.

Carbides introduced many new and different problems in the design, fabrication and application of cutting tools. The high modulus of elasticity and the low ductility of carbides require the use of tool designs other than those employed with high speed steel. High speed steel tool angles, it was found, could not be applied to carbides because they caused the carbides to chip at the cutting edges. Thus negative rakes are sometimes required to strengthen the cutting edge.

It also was found that the entire tool could not be made of the cutting grade of carbide. The chief reason for this, in the early days of carbides, was cost. Therefore, to compete with competitive high speed and cast alloy tools, it was found advantageous to only tip the cutting edges with carbides. This meant using a steel shank and milling into it a pocket or recess to accept a carbide tip of suitable size and shape. This method of making a tool presented many problems, some of which are still with us today.

The art of brazing advanced to where most of the difficulties encountered with tipped tools are no longer serious. However, the weak link in the chain is the tool shank. This weak area becomes apparent as deflection or deformation of the steel shank immediately under that portion of the carbide tip that is carrying the load

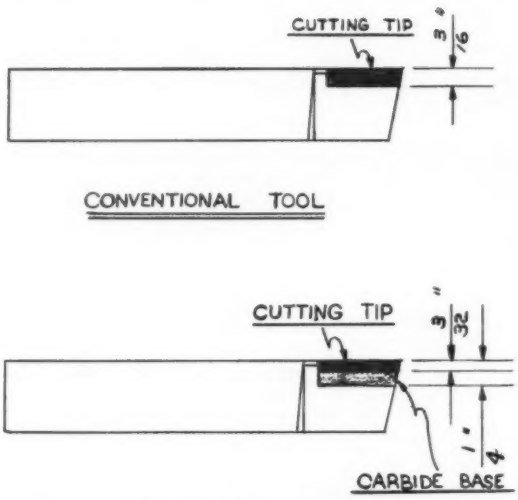


Fig. 1. The lower tool illustrates the use of a tougher grade carbide brazed under a tip of the cutting grade. Depth of milled recess is increased slightly to accommodate tip of greater thickness. Construction is based on tool with ¾" square shank.

of the cut. Heat-treated steel shanks have been used but are often of little value, since the heat conducted through the carbide into the shank is often sufficient to anneal the steel.

Tools have been observed where the braze material had deformed or squeezed out from under the tip under heavy loading. This condition is evident only before failure of the tools. If tools are allowed to operate in this condition, complete failure results and this evidence is lost.

Mechanically-held, "on-end" insert tools became quite popular in an effort to overcome shank failures and brazing difficulties. An insert tool using either a solid round, square, triangular or rectangular insert, however, answers only a part of the problem.

Shank deformation and brazing strains are no longer troublesome, but now the tool geometry is too tightly controlled by standard insert shapes, sizes, and the negative rakes usually used to provide cutting relief. Insert tools definitely do have a place in the field of metal cutting but are not a "cure all" for all tool trouble.

The clamped-on tool tip is a further step in the right direction — in that, here again, the carbide is free of all brazing strains. It is entirely possible to use a hardened steel plate under the carbide tip to provide adequate support and prevent shank deformation at the nose. Under such conditions, the carbide tool can be designed so that it is free cutting. However, for structural reasons, this type of tool can only be used in relatively large shank sizes. A disadvantage of the hardened steel plate is that it loses its hardness as the heat of the cut is transferred through the insert.

A better way of approaching this problem would be to concentrate on providing adequate support for the brazed carbide tip. This, then, would make it possible to extend the life of certain tools considerably.

One method of achieving this would be to employ an additional tip of a tougher grade of carbide, brazed under the tip of the appropriate cutting grade. An example is shown in Figure 1, where the depth of the milled recess is increased slightly to accommodate a tip of greater thickness. This bottom carbide tip can be referred to as a base. It can be made of a tougher grade of carbide such as an impact resistant grade; a grade such as that used for header dies provides an excellent base for the harder grades of carbide used for precision finishing.

Tests have been conducted with experimental grades of carbide, which ranged in hardness from 94 to 95 Rockwell "A", to determine their strength under actual cutting conditions. Conditions of the test were: Material, SAE 1045; hardness, 200 Brinell; speed, 100 sfpm; depth of cut, ⅜"; feed, variable — increasing to failure. The tool had a 1" square shank, 0° S.C.E.A.; 8° E.C.E.A., 3/64" rad., 6° side rank, 7° relief, and honed cutting edge.

Using a tool having a 3/16" x ⅜" x ¾" tip brazed to a shank of SAE 1095 steel, the test was started at 0.010" feed and increased to the

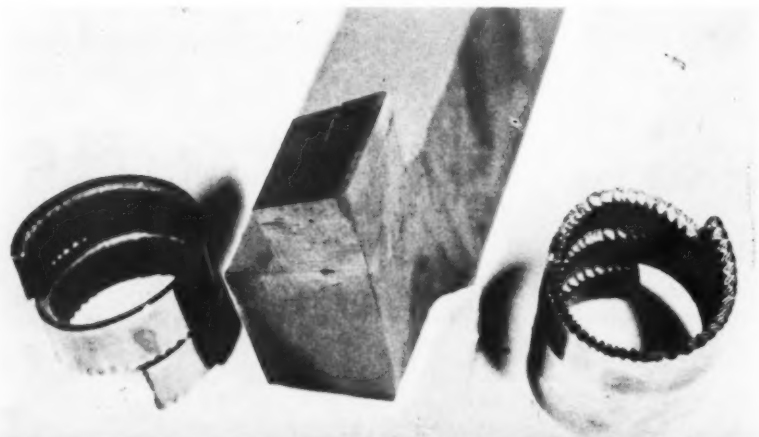


Fig. 2. Tool used during cutting test with stepped-up feeds. Similar tools later proved successful in boring large cylinders, in thread cutting and profile turning of shafts.

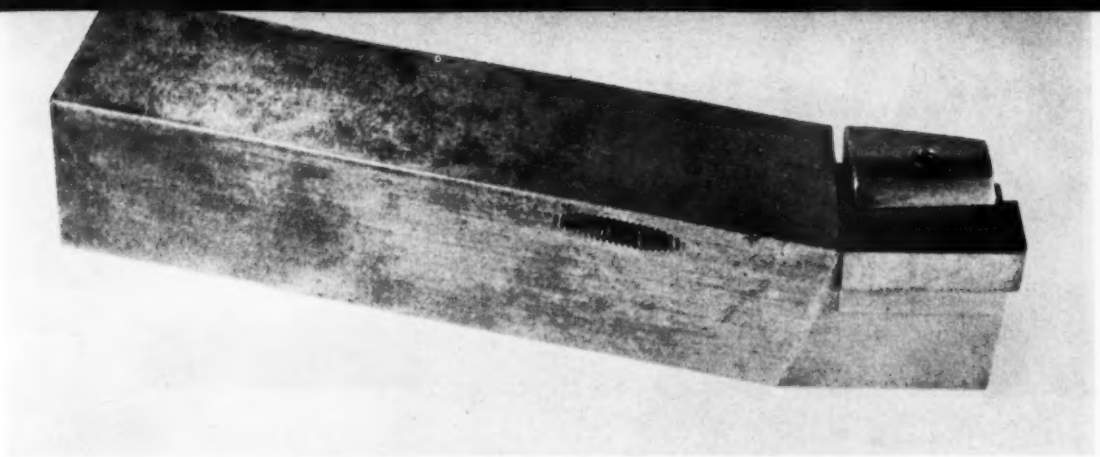


Fig. 3. This mechanically-held tool includes a hardened steel plate under the carbide cutting tip. Disadvantage here is that hardened steel plate loses its hardness as heat of the cut is transferred to insert.

point of failure which occurred repeatedly at **0.046"** feed. An examination of the shank indicated slight deformation. Since the shank was not strong enough to support the carbide without deforming, breakage occurred.

It is assumed that this deformation is evidence of both high heat adsorption and impact. Softening of the shank material in the joint area, which would lead to such deformation, undoubtedly permits a localized high elasticity in the shank. Thus, as chips break and cutting pressures fluctuate, vibration is induced. The result is — a high speed impact loading of the carbide, coupled with the brittleness of carbides and loss of support at the nose, leads to eventual failure by breaking off the nose.

New tools were prepared using a header die grade of carbide as a base with an inlay of the cutting grade of carbide along the cutting edge. The inlay was reduced to ⅛" thick by ¼" wide by ¾" long. The test was started again at 0.010" feed and was intended to continue to failure; however, this point was not reached on the test equipment used because of overloading of the drive motor. The feed was increased as before, but the greatest feed reached was **0.093"** per revolution with indicated horsepower at 28 hp. At this feed rate, several tests were run to prove the performance of this design.

In this test, the feed rate was increased 100% over the point of previous failure, using the same cutting grade of carbide. The tool used for this test is like the one shown in Figure 2. Note the design of this tool — the carbide was brazed on top of the shank, and no shoulder pocket was used to back up the carbide when cutting at these feed rates. Yet tools of this type proved successful on production applications such as boring large cylinders, thread cutting, and profile turning of shafts.

Tools designed as those illustrated in Figures 1 and 2 in general take a shank size under 1¼" square. Depending upon the tool style, those having a shank of ¾" square and larger come within the range of a throwaway or clamped-on tool tip.

We previously noted that, with use of a hardened steel plate beneath the clamped-on carbide tip, excessive heat developed in cutting may be transferred from the tip to the steel plate and draw the hardness of the steel down to where it no longer can support the tip. Such tools may be improved by substitution of a plate of impact resistant grade of carbide as a seat under the cutting grade. The heat transfer will have no effect upon the carbide plate.

The use of a carbide seat beneath the cutting tip on a clamp-on type tool has now become standard in certain tool lines. However, there are many machining operations where a brazed tool is either preferable or mandatory. But,

Fig. 4. Smaller tools like this one, with shank size ½" square or less, are successful in eliminating breakage on a profile cavity boring application on shells. Entire shank is of impact resistant grade of carbide, using a thin brazed tip of the cutting grade carbide.

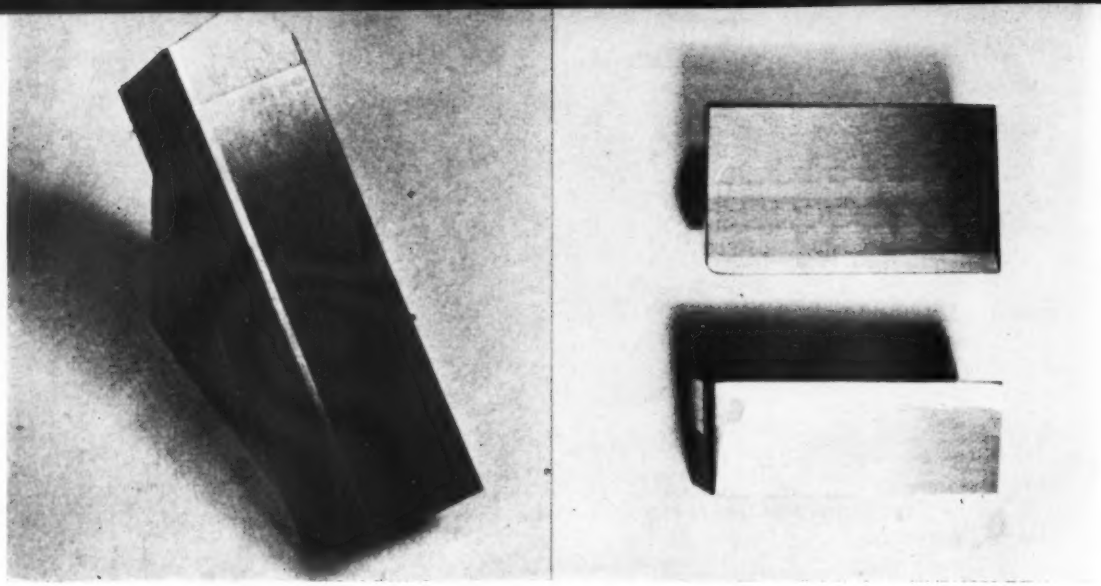


Fig. 5. A, left, and B, right, show the appearance bi-carbide tools of the future may take. Shanks may be an impact resistant grade of carbide with an inlay of a cutting grade for the cutting edges. Brazing would no longer be required since both grades would be bonded into a single mass.

here too, the principle of a carbide seat will be found applicable as demonstrated by the tests mentioned previously.

Small tools having shank sizes ½" square or less may be improved by having the entire shank made of an impact resistant grade of carbide. The tip recess could be formed in the usual way to accommodate a thinner tip of a cutting grade of carbide. Figure 4 illustrates a tool of this type. Tools of this type may be known as bi-carbide tools and, as such, have been found successful in eliminating breakage on a profile cavity boring application on 105-mm rocket shells.

The braze (if used) does not deform or squeeze out of the joint between the cutting grade and the base or structural grade, because it is possible and desirable to have a very thin or tight braze. Brazing two grades of carbide together, since their rate of expansion is nearly the same, does not present the problem of fighting braze strains due to different rates of expansion as between carbide and steel. The joint between the base carbide and the steel shank does not present a problem, because the base grade is strong enough to withstand the braze strains.

The first thought to be aroused by the bi-carbide tools using carbides as supporting members, is cost. First cost should not be the only consideration in attempting to work out a successful tool application. Added performance can outweigh additional first cost.

Bi-carbide tools of the future, for specific applications, may also take on a new appearance. Their shanks may be of a structural grade of carbide with an inlay of a cutting grade of carbide for the cutting edges. Brazing would no longer be required, for the cutting grade and structural grade of carbide would be bonded into one single mass.

A tool of this type would appear as shown in Figure 5A when used as a complete tool, and Figure 5B when used as an insert for a mechanically held or clamped tip tool.

With adequate support for a cutting grade of carbide, it is possible to open an entirely new field for the effective use of new harder carbides. The inlay of a cutting grade of carbide may be a thin, narrow strip and, as such, will have some mechanical flexibility. The carbide structural member supporting it will provide the required support to give a superior tool.

With tools combining bi-carbide construction with the superhard carbides of the future, tool life can be expected to be 200 to 300% greater than that obtained today. At present, it is entirely possible to use harder grades than normal — if tools are constructed somewhat along the lines described above.

However, the design and application engineer should keep in mind that the tools should be designed to meet the requirements of each specific job. Survey the many applications where tool failure is serious, then decide — is it the cutting edge itself, or the tool shank, that is contributing to the failure?

Undoubtedly, new families of carbides will be developed. These will impose new problems just as high speed steel, cast alloys, and the present carbides did. These problems must be met with either new tool designs or new methods of application to enable us to produce better for less.

end

Some Ideas for a

LOAD INTERCHANGE CENTER

by George H. Logan
Consultant Engineer
Los Angeles, California

Work loads vary, and so must the supply of workers. The Load Interchange Center loans workers temporarily to departments needing the workers' specific skills.

NO INDUSTRY ENJOYS THE LUXURY of a purely constant work load on its labor supply. Even companies that approximate such a utopian state are in the minority. Yet, in-plant manpower load variations are among the prime reasons for high costs of operations.

It takes no imagination to bring load and manpower into balance through the familiar "reduction in force" method. Of all possible equalizers, however, this is emphatically the least attractive. It should not be used so long as there is an alternative, because we all know its pernicious aspects too well: Skidding morale; repetitious and costly ascension of learning curves; and often, permanent loss of valuable skills through "temporary" layoffs.

The Load Interchange Center is one of the several layoff-preventive techniques available to companies. Briefly, it is a formalized in-plant administrative function for controlled temporary loan of personnel from underloaded to overloaded groups.

The idea is not new. Short-term personnel loans between groups to alleviate localized high load conditions are quite generally practiced. But in most instances, such movements lack control; they are not made within a framework rigorously designed to optimize the reduction of overhead and the reduction of labor turnover. Only a carefully organized procedure for loaning personnel will evoke the utmost benefits.

The Load Interchange Center can be operated at a negligible cost compared with the tangible savings and intangible benefits secured. In larger companies, one full time Administrator and a secretary can run the Center. In medium to small size companies, the Center's administrative work can be assigned as collateral duty. Facility-wise, usually a desk, telephone, and filing cabinets suffice.

Two important preliminary steps are necessary to prepare the launching of the Center. They are:

(1) Plan Design
(2) Supervisory Indoctrination

Plotting the Course

Any system should be custom-tailored to the *modus operandi* of the plant where it is to be installed.

An excellent springboard for Plan Design is management's establishment of a Steering Committee, typically made up of department heads; and a Working Committee, composed of men at the supervisory level. The Working

TEMPORARY MANPOWER AVAILABLE

Date: _____

To: Administrator Load Interchange Center

From: _____ Ext: _____

Dept: _____ Unit: _____

Due to (forthcoming ☐) (existing ☐) temporary reduced work load, the following member of this Unit will be available for temporary assignment to another Unit.

Name: _____

Classification: _____

Period Available: From: _____ To: _____ Inclusive

(firm period ☐) (approx. period ☐)

Remarks: _____

_____

_____

Signed: _____ Title: _____

_____

FOR LOAD INTERCHANGE CENTER USE ONLY

Arrangements completed on _____ for assignment of above to: _____

_____

FIGURE 1

Committee submits a design proposal which is studied and revised if necessary by the Steering Committee and by management. Leaving room for local originality in plan detail, the general formulations for the Center should agree with the following concepts.

In the planning stage, the committees should anticipate that good communications will play a large role in the successful operation of the Center. Insofar as possible, information coming into and going out of the Center should be on prepared forms. Figure 1 shows the Supervisor's form used for finding work for his people to do. Figure 2 is the form used by a Supervisor who needs stop-gap help. Each of these should be in duplicate; the originator should retain a copy. Note the explicit use of the word "temporary" on the forms, emphasizing that the transaction is not in any sense a transfer.

The Center should be located physically close to the personnel background files. When, for example, a Supervisor needs the loan of an electronic technician, and the Administrator's records show that several are available, the Administrator must have sufficient information to recommend the individual most likely to do the specific job best. Moreover, as the operation develops the Administrator will stimulate feedback information, and he will build a fund of records on how particular loanees performed in particular loan-out assignments.

On the policy side of the Plan, the Center's functions should be limited to information collection and distribution — the mechanics of manpower loans. To gain the support of Supervisors, the Center should have little or no direct contact with the individuals being loaned. The Supervisors with light loads should have the exclusive prerogative of deciding which, when, and for how long members of their crews are available for loan. Supervisors with concurrent heavy loads must have the decision in choosing from personnel available, even through the Administrator offers recommendations based upon qualifications and performance record data. In the operation of the Plan it should be assumed that the Supervisors are most fully acquainted with the intricacies of particular assignments.

A good filing system is essential. Typically, three basic files are set up in the Center: Temporary Manpower Available, Temporary Manpower Required, and Temporary Manpower Assigned. When the temporary loan of a worker is effected, the complementary Manpower Available and Manpower Required forms are attached together and moved into the Manpower Assigned file. Some companies prefer, however, to design a separate Manpower Assigned form to show transaction consummations. In any case, care must be exercised to segregate the active and inactive portions of the files.

Explaining the Plan

The underlying reason why the Load Interchange Plan can be made to succeed is that there is a large identity of skills in work groups, although the groups themselves are known by different titles. For example, most toolmakers function very satisfactorily as precision machinists or experimental machinists. An electronics development technician can perform commendably in electronics production tests. A typist from Accounting can type for Sales. The greatest possible dividends from interchange will hinge upon the Administrator's skill in filling the gaps with the most qualified people available within fixed time spans.

After committee and management approval, the program is ready for the Supervisory Indoctrination process. The degree of success that the Plan will enjoy will depend very much on how this step is handled.

Experience has shown that the instinctive first reaction of many Supervisors will be negative. Some of the thoughts that will probably have to be faced and overcome include:

"I may permanently lose some of my best workers to other groups."

"The Plan may tend to shrink my group."

"My men loaned out may not be returned to me at the time I stipulated."

"My men may get spoiled in other groups; maybe they won't hit the ball when they return to home base."

"If I show a lot of 'availabilities' the brass may decide that they don't need my group at all."

Under the philosophy of the Plan, none of these objections are valid. A convincing denial of them must be secured before the work of the Center is started.

The Administrator is the logical champion of the Plan. He should conduct a series of indoctrination sessions for Supervisors and invite uninhibited discussion. A member of the Steering Committee should attend such meetings to assist in Plan Interpretation. These briefing sessions must establish firmly the simple, straightforward intentions of the Plan, which is to reduce overhead and reduce labor turnover. Charts can be used to show that these targets can be reached through better normalizing of the Load-to-Manpower ratio.

The discussions should stress the point that transfers are completely outside of the scope of the Plan; transfers are handled under separate existing procedures. Only loans of personnel for specific periods stated in writing are possible under the Load Interchange Plan. On the date prescribed the man loaned must return to his home group. An extension of the loan period can be obtained only with the consent of the loaning Supervisor. Nothing could nullify the Plan faster than transgressions of agreed upon loan periods.

Some Supervisors will have concern as to whether the Plan will tend to reduce permanently the size of their groups. Indoctrination should point up vigorously that an opposite trend will actually take place. The Administrator should ask the Supervisors to take the long look rather than the short look and to consider the chain reaction of cause and effect: Improved manpower utilization leads to reduced direct and indirect overhead; that leads to the enhanced competitive position of the company; that leads to increased sales and backlog; and thus, inevitably, to a larger rather than a smaller manpower force.

Some Supervisors will feel that their men might downgrade in attitude and diligence after working in the environment of neighbor groups. With rare exceptions, a man does not lose his conditioning of months or years in days or weeks. If a man has been attached temporarily to a neighboring group of indifferent spirit and drive, it is very probable that he will return to his home group with an even greater pride in it because of the exposure to a contrast. And while on loan, the example of his own diligence may stir a similar spark in his hosts, a significant extra dividend from the Plan.

TEMPORARY MANPOWER REQUIRED

Date: _____

To: Administrator Load Interchange Center

From: _____ Ext: _____

Dept: _____ Unit: _____

Due to (forthcoming ☐) (existing ☐) temporary work overload, the following skills will be required for temporary assignment to this Unit:

Classification: _____

Number Required: _____

Period Required: From: _____ To: _____ Inclusive

(firm period ☐) (approx. period ☐)

Remarks: _____

_____

_____

Signed: _____ Title: _____

_____

FOR LOAD INTERCHANGE CENTER USE ONLY

Assignments to above requirement:

Name: _____ From: _____

Name: _____ From: _____

Name: _____ From: _____

Name: _____ From: _____

FIGURE 2

What are other dividends to be gained from this program? The opportunities given to men and women to work briefly in other groups help expand their skills. Moreover, they gain a better understanding of the overall plant operation, they obtain a feeling for how their normal work meshes with the total pattern, and they attain a desirable subjectivity toward their normal work. All of this is stimulating and valuable to the people, and certainly valuable to the company.

There is little doubt that during the indoctrination sessions the format of the Plan will be squeezed through successive wringers. This is good. Worthwhile revisions to simplify the Plan and make it most practical will be exposed.

The Load Interchange Center is not a complete panacea for high overhead and labor turnover. But it ranks high among the effective weapons for waging the fight; it has a down-to-earth straightforward character; it will produce tangible results that can be measured; and it will generate corollary dividends that may be nearly as valuable as the secured primary goals.

end

How to Establish Sizes of

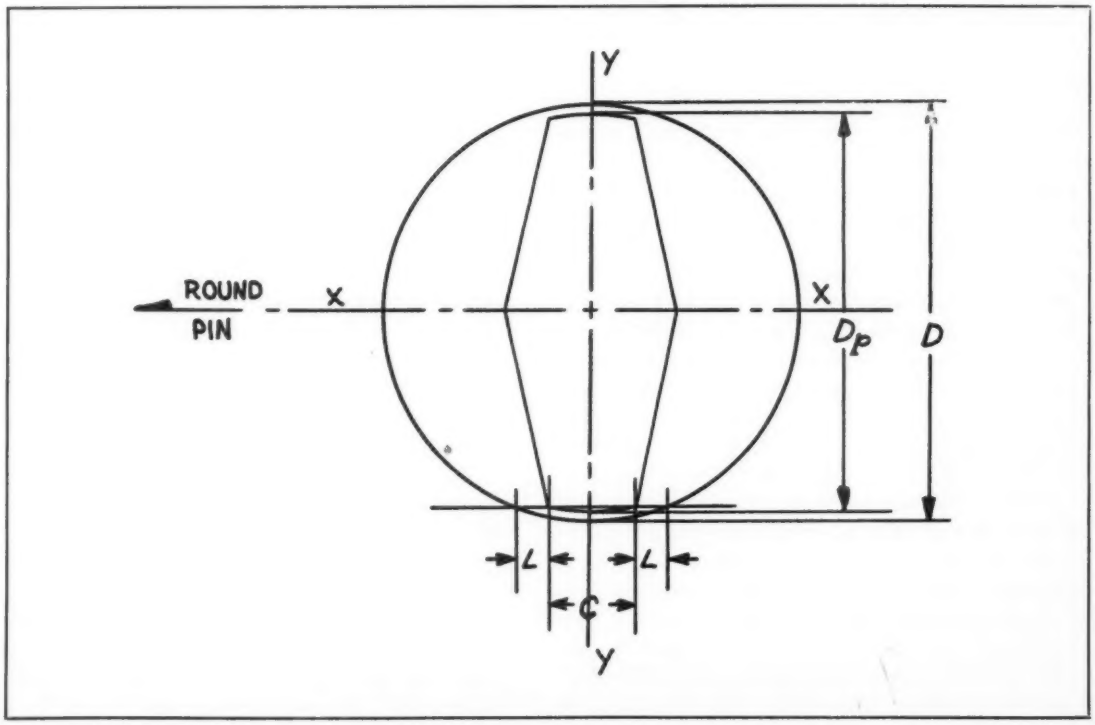
DIAMOND PINS

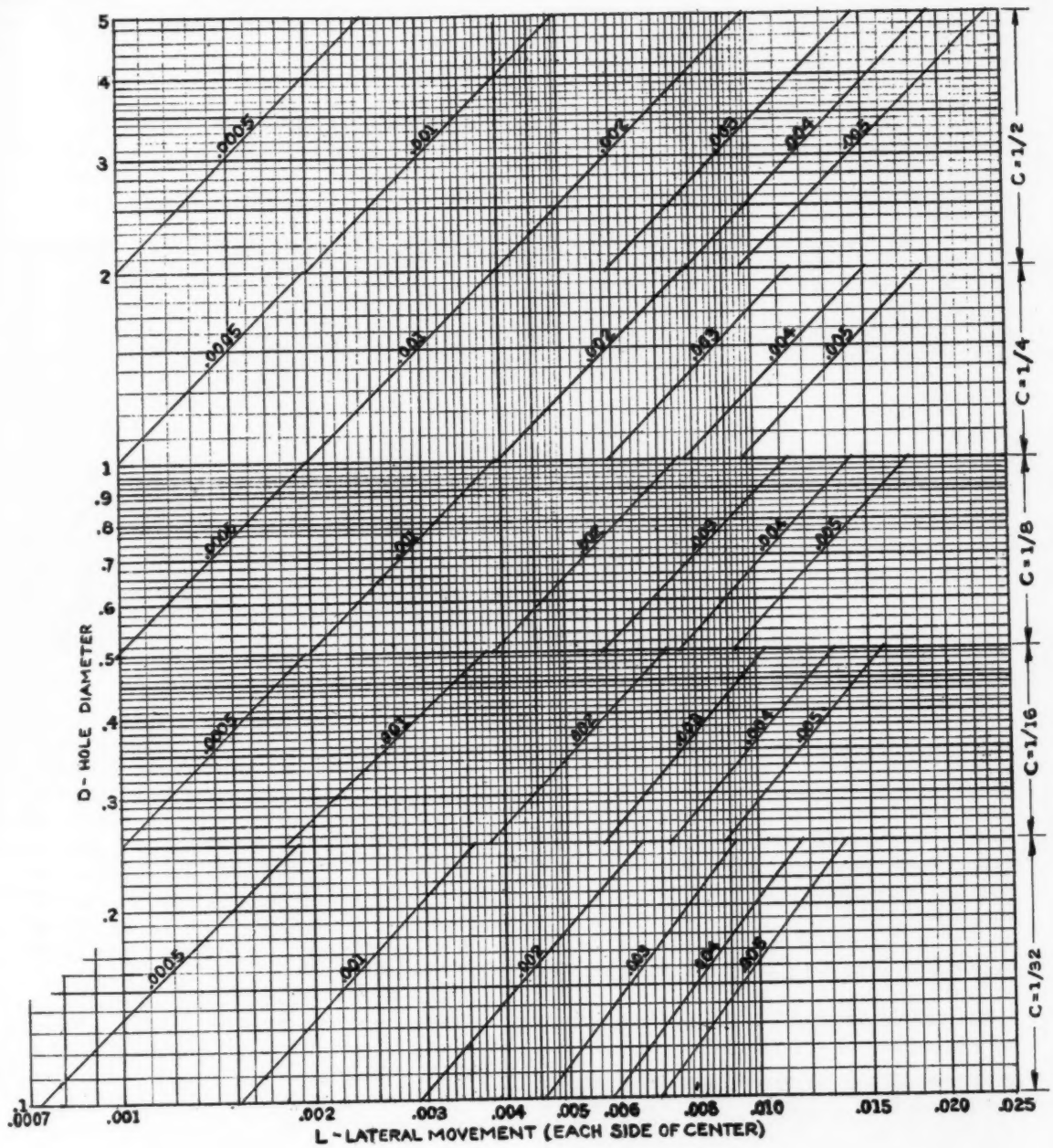
by W. O. Becker
Staff Industrial Engineer
MERGENTHALER LINOTYPE COMPANY
Brooklyn, New York

WHERE HOLES ARE USED FOR LOCATING, either straight, taper or diamond pins are used. The use of two straight pins is not recommended for precise positioning, since a slight dimensional variation between holes may make it difficult to load or remove the part. Taper pins are not self-cleaning; foreign matter may become lodged between pin and sidewall of hole, preventing part from seating properly and resulting in poor relationship of design details. It is considered good practice to use one straight and one diamond pin.

Pointing the diamond pin in the proper direction, at right angles to a line projected through the two centerpoints, makes it as satisfactory for location as a close fitting round pin in addition to facilitating the rapid loading and removal of the part.

Reference to the diagram shows that movement of the part along the Y-Y axis is as fully





restricted as it would be with a round pin. Lateral movement along the X-X axis, however, is equal to the distance L on either side of the established center dimension "C".

The pin diameter Dp is governed by the hole diameter and its tolerances. The distance L can be readily determined by the chart on the facing page. The dimension C of the pin to be used is:

$\frac{1}{32}$" for holes up to ¼" dia.
$\frac{1}{16}$" for holes ¼" to ½" dia.
⅛" for holes ½" to 1" dia.
¼" for holes 1" to 2" dia.
½" for holes over 2" dia.

The slope lines give the *total* tolerance as applied to the hole. (This is equal to the difference between maximum hole size D and maximum allowable pin diameter Dp.) At the intersection of the selected slope line and the horizontal line representing the hole diameter D, the projection downward will establish the distance L as required. end

Center Drive Tracing Lathe

UPS JET DISC PRODUCTION

The center drive lathe simultaneously machines both sides of jet engine compressor discs, using tracers to produce difficult contours to a high degree of accuracy.

THIN WEB SECTIONS AND CONTOURED FORMS of jet engine compressor and turbine discs, coupled with fine tolerances and surface finish requirements, equals a tough machining job. Present jet engine designs call for discs approximately 0.115″ thick, and there is a demand building up for discs 0.080″ thick. In theory, a disc with a web thickness of 0.010″ would be sufficiently strong, if it could be machined.

The so-called T-lathe, designed for this type of work, has not been entirely successful for such thin sections because inaccuracies and distortion arise from the many chuckings required when machining one side at a time. By chucking the discs in a center drive lathe and machining both sides of the discs simultaneously, these problems are being resolved. In addition, heavy stock removal requirements and intricate contours make tracer control of the lathe feasible.

The cutting tool is accurately positioned for the boring cut on this center drive tracer controlled lathe. Note the roller support to the disc.

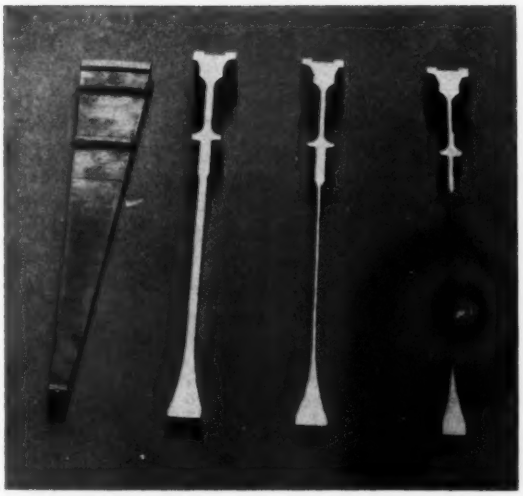
These are the reasons Gisholt developed the tracer controlled center drive lathe. Several of them are now in operation at Pratt & Whitney Aircraft, Hartford, Conn., and eventually 29 will operate there. P&WA records indicate that machining time for the jet engine discs has been decreased from 281 min to 181 min since using the new lathes. In another case, 30 min has been cut from the time required for machining a turbine disc.

The Gisholt Masterline center drive tracing lathe, with a capacity for 28″ dia discs, is designed for heavy duty rough machining operations in either stainless steel or titanium. It is also capable of producing to the extreme accuracies required for finish machining the discs. Its main advantage, however, lies in the fact that it is set up to machine both sides of the disc simultaneously, using a four-pass Gisholt JETracer on each side, with templates governing movements of the tools for roughing

and a separate template and new tools indexed into position for the finish cut. This arrangement offers complete accuracy in the reproduction of the required contours and a very fine finish through a variable speed drive controlled by movement of the tracer cross slide.

To machine the discs, both carriages are retracted and the workpiece, which has previously been placed in a chucking ring, is loaded and clamped in the center driving unit. The carriages are advanced independently and positioned for a straight facing cut on the small hub diameter. Tools are to the rear of the centerline and the spindle is running in reverse. Accurate positioning is assured using longitudinal feed dials. Then the two roller supporting arms are positioned, providing support at the center on the machined surface and counterbalancing each other so that there is no distortion in the part.

The cam drums are positioned to present the roughing templates to the tracer styluses, the carriages are located longitudinally, and the first roughing cut is made across the face, with the tools starting to the rear of the centerline near the outside diameter of the disc. With the proper turret tool in position, the cross feeds to the cross slides are engaged and the cut proceeds across the entire face of the disc with the direction of spindle rotation changing as the tools cross over the centerline. A semi-finishing cut is taken in the same manner and then one of the carriages is accurately positioned and the center bore is rough and finish machined. Then the disc is removed from the machine, and after a stress relieving operation is finish machined on the same lathe. end



Sections of workpieces show contours and web thickness: (left to right) 0.115" thick web; 0.080"; 0.007".

Use a Drill Press to

Lap Flat Faces of Rollers

by John A. Waller
Consulting Engineer
London, England

A PROBLEM THAT CAN CREATE DIFFICULTIES in a small shop is the necessity of lapping flat faces on circular parts, particularly when the quantities run into some thousands of pieces.

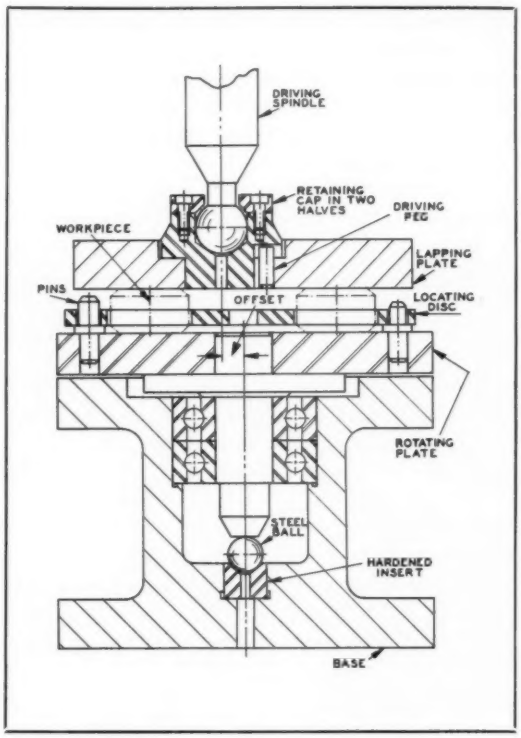
The simple roller illustrated in the drawing of the tool is produced on a six-spindle automatic. After heat treatment, both faces on the part are ground and lapped. The latter operation requires a special work fixture as

shown in order to accomplish the task in a reasonably fast time.

Six rollers are inserted into holes bored in a thin locating disc. This item is, in turn, floated over the lower rotating detail and driven by it by means of two shouldered pins. In both instances, a close fit is undesirable. It would interfere with the quick loading and unloading of the workpieces and would tend to restrict their movement. A clearance of 0.005" guards against these conditions and prevents any jamming due to tiny particles of material filling the holes.

The rotating plate is made from mild steel with the contact face — where the components seat — case-hardened to resist wear. In order to avoid excessive friction, the rotating plate does not seat on the base surface. Instead, it is carried by a fairly large shouldered plug driven into the plate bore. This plug also locates in twin ball bearings that are pressed into the base member. Finally, the lower end of this plug is hardened to provide an excellent surface to bear on a single steel ball. The steel ball is hardened, as is the insert in which the ball seats.

This lower fixture is set up on the drilling machine worktable and arranged with the centerline of the rotating plate off center in relation to the cast iron lapping plate, which is driven from the drill spindle. This is the crux of the design, and an offset of 3/8" was used in this instance.



With this relatively inexpensive lapping fixture, a drill press may be employed for production finishing the flat end surfaces of cylindrical components.

A speed of about 150 to 200 rpm is used when driving the lap, and with the above mentioned offset the finish secured is of a high order. If a considerable amount of stock must be removed, then a greater degree of eccentricity will shorten the operation but at the expense of finish; for many products this is not detrimental.

Pressure imparted to the top lapping plate makes essential the incorporation of a hardened thrust bushing. The ball end of the drive spindle is also hardened and rides on a conical surface of the insert. A retaining cap over the ball end of the spindle causes the upper plate to lift with the drive spindle when the latter is raised from the work.

In all equipment of this nature, grind paste and dust have an unfortunate way of penetrating into the smallest crevice. In this fixture, a shroud to divert such matter from between the rotating plate and base is advisable. This can be a circular sheet metal cone screwed to the lower rotating detail at convenient intervals; this member is not shown because it in no way affects the general principle of the lapping attachment.

end

Although the exact conditions that dictated Mr. Waller's design are not known, it is felt that the following refinements can be considered in adapting his design to your needs:

- A spacer sleeve could be used to separate the two bearing races so as to give greater support to the carrier plug and, thus, greater rigidity to the setup.
- A hardened insert in cavity of base member may not be necessary, since the thrust ball is not likely to rotate. However, the insert can be means of adjusting clearance between rotating plate and base — by grinding the lower face of insert as needed.
- The lapping plate can be driven by using 1) a horizontal pin passed through a sloppy hole in the driving spindle ball-end and anchored at each end into the hardened insert, or 2) an offset arm adapter in the drill press spindle. In the latter case, the drill press bearings would probably take the eccentric load considering the low speeds used.
- If production would justify the expense, a large ball or roller thrust bearing between the rotating plate and the top face of the base would be advisable.

— The Editors

Automatic Press and Progressive Die Are Suited to

ECONOMICAL LIMITED RUN STAMPING

AUTOMATIC PRODUCTION OF STAMPINGS finds its fulfillment in long run or continuous operation. However, there are many instances where an automatic operation on short runs is not only economically feasible, but profitable. Many manufacturers are making sizable savings through the automatic production of short-run, multi-operation parts, particularly where the part is producible in an economical progressive die.

Such a case is found at Fred Riebel & Company of Chicago. The part concerned is a stainless steel clip used in a forced air register (Fig. 1). An analysis of the clip design and the production requirements showed that 7 bending operations would have to be performed and that production requirements would be limited to 25,000 pcs on each of 4 to 5 runs/yr. These conditions were evaluated carefully to determine whether a first-operation die, augmented by two secondary-operation dies would be re-

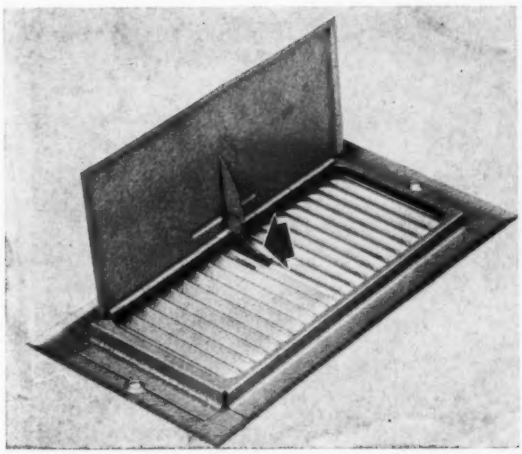


Fig. 1. Forced air register showing application and location of stainless steel clip.

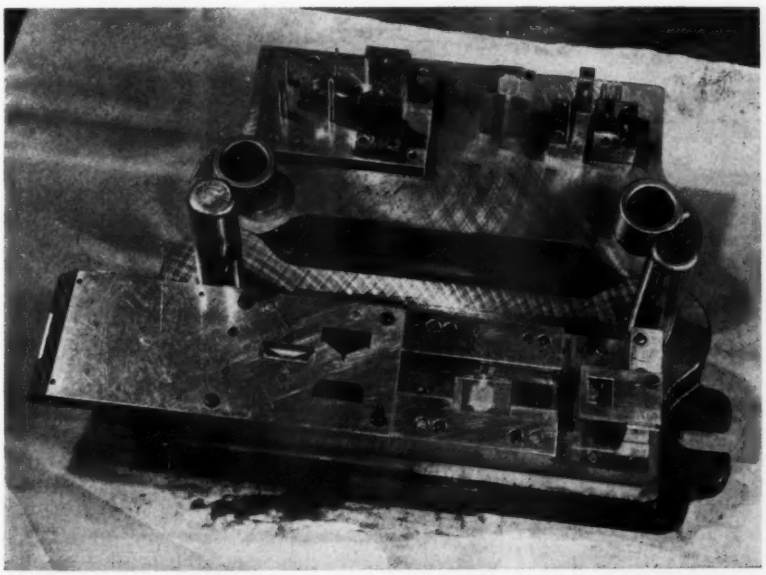


Fig. 2. Progressive die used on automatic press for stamping stainless steel clips — a hinging component for forced air register assembly.

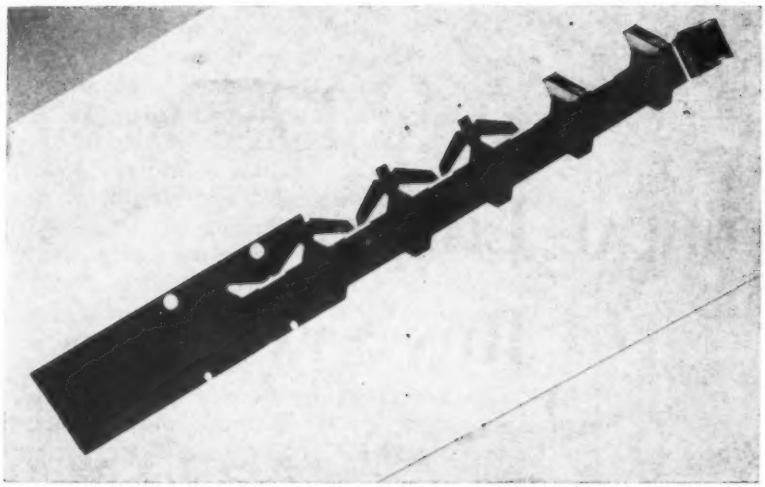


Fig. 3. Stock strip showing pilot holes and profile of stock at successive stations from 1 to 7 in forming stainless steel clips for forced air registers.

quired or whether a single progressive die should be employed.

A single progressive die (Fig. 2) was decided upon. This, after a calculated cost comparison indicated that clips made in three separate dies would cost 6 to 7 times as much as those made in a single progressive die used in an automatic press.

The progressions, indicated by the stock strip in Figure 3, are as follows:

1. Feed material automatically through a long stock guide and pierce two pilot holes in scrap.
2. Position material with two pilots, and notch partial contour.
3. Trim both sides to required contour.
4. Idle station.
5. Form up three ears.
6. Idle station.
7. Part, form up four sides, and air eject.

Spring pins are employed on both trim punches, the first form punch, and the parting punch. These pins keep the slugs from pulling up and interfering with normal feeding. Riser pins are also used to keep the stock strip from getting caught on the cutting edges and to lift it over the first forming station during advance of the strip.

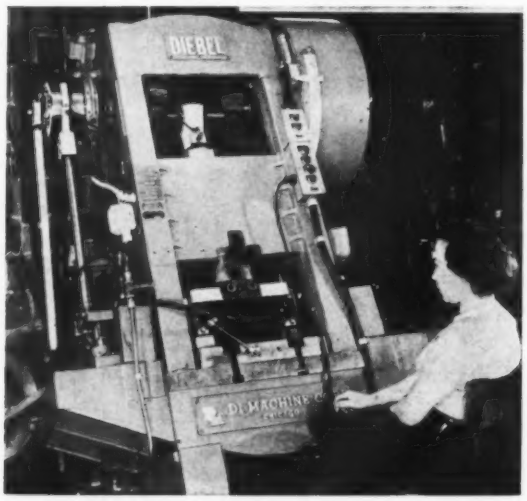


Fig. 4. 25-ton Diebel automatic press that operates at 200 strokes/min. and produces 25,000 pcs in a 3½ to 4-hr period.

Pressure pads in both forming stations are used to lift the strip and the part out of the forms on the upstroke and to keep the material flat on the downstroke. An idle station on each side of the first form allows the material to flex during the first form operation, since this portion of the strip has to go below the plane of the die at the bottom of the stroke. A positive stripper harness in the final forming station strips off the part from the final form punch on the upstroke prior to air ejection.

The clips are produced on a 25-ton Diebel automatic press operating at 200 strokes/min. A run of 25,000 pcs is normally finished in 3½ to 4 hrs, including setup time. It has been found that automatic production of this limited quantity is both feasible and profitable. This operation provides substantial labor savings by completing the parts in one automatic sequence. The use of one automatic press, instead of three non-automatic presses, also gives a smoother work flow, work is in process for a shorter period of time, and a more economical use of press room space is realized.

In addition, toolroom costs are reduced because only one die must be maintained. With automatic press operation, the positive locating of stock strip for each working period of the press is assured, thus shearing of punches and die sections is avoided. This positive locating of stock combined with proper automatic press construction results in more production between grinds, fewer sharpenings with longer die life, and more uniform workpieces. end

DIE FACE MOULD COATINGS FOR DIE CASTING DIES

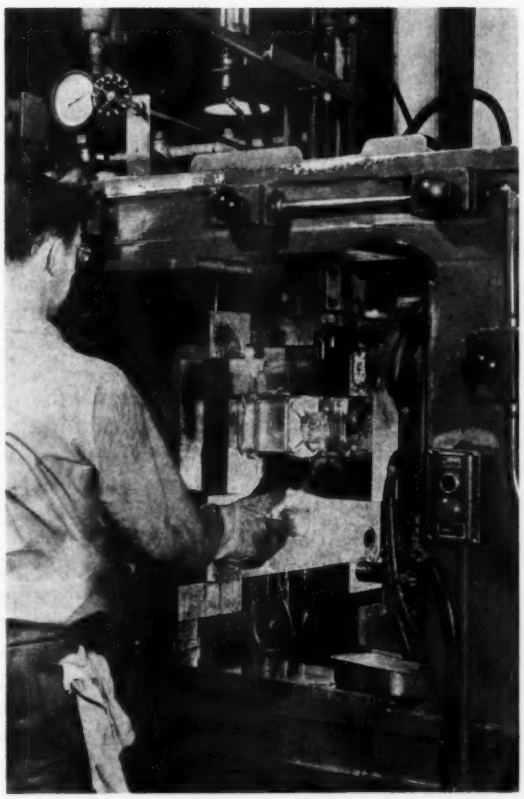
by T. E. Murray
Engineer, Metal Working Dept.
E. F. HOUGHTON & CO.
Philadelphia, Pennsylvania

IN GENERAL USE today there are eight different types of die face mould coatings which have been used individually or in various combinations with one another. These are:

1. Heavy mineral oil types
2. Light mineral oils — 100 SUS at 100° F
3. Waxes and petrolatums
4. Beeswax
5. Fatty oils, such as tallow, lard oil, cottonseed oil, rapeseed oil, fish oils, etc.
6. Pigment and oil suspensions
7. Pigment and water suspensions
8. Silicone fluids

For years the selection of a die face mould coating has been on the basis of individual experience, or by using cut-and-try methods. Extensive surveys throughout the country now make it possible to approach this problem in a more orderly fashion, by first considering the multiple functions of this versatile coating.

The primary function of a mould coating is to prevent adhesion of the casting metal to the die. While this fact is immediately recognized, there are additional functions equally important. A mould coating should provide a tough, heat-resistant film with cooling or cushioning action at the die surface. This protects the die surface from radical temperature changes, thus eliminating considerable surface stresses in the die blocks, and premature failure of these expensive tools.



The mould coating selected should provide clean castings, with good, smooth surfaces. When we say "clean castings," we do not mean they should be immediately ready for plating,

Adapted from a talk at a recent meeting of the Society of Die Casting Engineers and reprinted from THE HOUGHTON LINE.

but rather that they should fit into the regular or standard cleaning cycle without requiring special handling. There should be no tendency for the coating to build up in the die cavity after repeated application, as this makes the maintenance of close tolerances difficult. While we realize that coatings will tend to build up in time, this can be kept to a minimum if the coating is such that it can readily be cleaned from the mould. The ability of a coating to resist gas development at operating temperature is also of prime importance in the production of sound castings.

As a result of the surveys previously mentioned, the following trends have been established in the use of these materials in the die casting industry:

- For the pressure casting of tin, lead, or zinc, particularly light, thin sections in non-complicated dies, the heavy mineral oils or cylinder stocks are used, as well as highly compounded products using these materials as base stocks. These mould coatings are dark in color and have a viscosity of 600 to 650 SUS at 100°F. They produce a light, tough film at die temperatures of 350 to 550°F and lend themselves particularly where castings are cleaned prior to plating.
- For the casting of heavy sections of zinc or light sections of aluminum, waxes and petrolatums are used for the mould coating. These materials produce an extremely tough, lasting film at die temperatures of 450 to 600°F. They are of light grease consistency, having melting points of approximately 130 to 140°F and produce fairly clean castings. These coatings are often used to touch up hot spots in the dies normally coated with the more fluid mould coatings previously mentioned.
- A similar preference is noted in the die casting of aluminum parts of light multiple cavity castings, such as used by the aircraft industry, for a fluid type coating consisting of a bright stock oil having a viscosity of 110 SUS at 210°F and a flash of 460°F fortified with a metallic pigment or graphite. Metallic pigment offers the advantage of cleaner castings and is more generally accepted in the industry. Molten metal temperatures encountered in the use of this type of compound range from 1180 to 1350°F, and die temperatures range from 450 to 550°F, according to size and design of part being cast, and the number of cycles per minute.
- Where higher die temperatures of 650°F are encountered in the casting of heavier aluminum parts, a heavier or paste type mould lubricant consisting of cylinder stocks and pigment is indicated. The heavier viscosity of 600 to 700 SUS at 100°F, and the higher flash point of 650°F, together with the pigment content combine to make a better mould coating when the casting is large or heavy. Such parts include automatic transmission parts for automobiles. Once again, we note that the cleaning of the casting or plating is not required. This type of coating is used neat and swabbed on the die.

About 1951, silicone fluids were made available to the die casting industry as mould release agents for aluminum, zinc and other metals and alloys. Silicone fluids are inert and do not react chemically with other materials. They are resistant to heat and thus there is no carbonization or fouling of moulds. They possess excellent release properties between the metal being cast and the die. Their low surface tension allows them to penetrate into small cavities and spread out to cover large areas quickly and evenly.

When silicone emulsions are used, softened water solutions should be made. The mineral salts contributing to hard water build up a scale. This scale must be removed periodically or it will build up in the die cavity, making it difficult to hold tolerances and maintain detail. Also, where parts are later to be painted or coated, silicone sometimes has been found impractical.

Pigmented mould coatings are required for the high temperatures involved in the die casting of brass. Those containing graphite have proven most promising at the higher die temperatures required for casting of these alloys.

There has been a widespread increase in the use of compounded mould coatings in the past few years. Increased effectiveness of these coatings over conventional oil films stems from the inclusion of lubricity additives, suspending agents to maintain a uniform dispersion of pigments, wetting-out additives to insure a rapid and complete spreading of the lubricant over the die surfaces, and adhesion agents to hold the coating in place against the washing action of the cast metal.

The effective performance of mould coatings is governed to a large extent by the variables in their composition. Such factors as percentage of additives and type of additives must be considered.

While considerable progress has been made over the years in the field of mould coatings, particularly with the introduction of silicone fluids, research is constantly seeking to develop new and more effective materials to meet the advancing needs of today's die casting industry.

end

Basic Factors in

BRAZING ALLOY SELECTION AND JOINT DESIGN

by Lester F. Spencer
Consultant
West Allis, Wisconsin

THE BRAZING OPERATION utilizes three major brazing metals and a series of special purpose brazing alloys of less importance. Most metals and alloys which melt above 1100° F may be joined commercially by brazing. The most notable exception is the brazing of aluminum to a dissimilar metal which has yet to be done with success in commercial operations.

One of the major brazing alloys is copper (and copper alloys) which is used extensively for the joining of ferrous metals. It is limited to use with a reducing atmosphere as obtained in furnace brazing; however, under these conditions it has the advantage of producing strong joints with a low cost, readily available brazing metal. Molten copper is free flowing and will penetrate into joints with small clearances or with interference fits. A disadvantage of copper brazing is the high temperature that is required for joining, according to the Research Division of the American Platinum Works. These temperatures, which are above 2000° F, are expensive to attain. In addition, these high temperatures may affect the properties of the metals being brazed and limit the life of the furnace equipment. Copper base alloys, which melt from 1600 to 1800° F, are used to braze both ferrous and some nonferrous metals.

One of the more recent developments in brazing is aluminum brazing metal, which is used to join aluminum. With this operation, aluminum and certain aluminum alloy types can now be joined with ease.

The third major group of brazing alloys includes a large variety of silver bearing alloys which will melt in the temperature range of about 1125 to 1600° F. Since these alloys are the most versatile of the three groups mentioned, a detailed discussion will be given. The silver brazing alloys, the more commonly used compositions being given in Table I, may be applied efficiently on all brazeable materials with the exception of the lower melting point alloys as exemplified by both the aluminum and magnesium base alloys.

The variety of composition types available in a wide range of melting and flow temperatures is an attractive feature of the silver brazing alloys. Thus, there is a composition for nearly every purpose.

The melting point of a silver brazing alloy is that temperature where the entire alloy is in a liquid state. There are certain alloys, such as type 23, that have but one temperature for both the melting and flow point. Such alloys, which are called "eutectics" and behave similarly to a pure metal, will be entirely in a liquid state at a single temperature. Thus, the molten portion of the alloy within the joint at any specific time will have an identical composition to that portion which has solidified.

In contrast, a majority of the alloys within this category will start to melt at one temperature and melting is not complete until a substantially higher temperature is reached. When the alloy is partially melted, the fluid portion will have a different composition than that

Table I—Nominal Composition of Commercial Silver

Type No.	Silver	Copper	Zinc	Cadmium	Tin	Nickel	Manganese	Phosphorous	Melting Point	Flow Point	Type No.
1	50.0%	15.5%	16.5%	18.0%	—	—	—	—	1160°F	1175°F	1
2	50.0	15.5	15.5	16.0	—	3.0%	—	—	1170	1270	2
3	45.0	15.0	16.0	24.0	—	—	—	—	1125	1145	3
4	35.0	26.0	21.0	18.0	—	—	—	—	1125	1295	4
5	15.0	80.0	—	—	—	—	—	5.0%	1185	1300	5
6	5.0	58.0	37.0	—	—	—	—	—	1575	1600	6
7	7.0	85.0	—	—	8.0%	—	—	—	1225	1805	7
8	9.0	53.0	38.0	—	—	—	—	—	1450	1565	8
9	20.0	45.0	35.0	—	—	—	—	—	1430	1500	9
10	20.0	45.0	30.0	5.0	—	—	—	—	1140	1500	10
11	25.0	52.5	22.5	—	—	—	—	—	1500	1575	11
12	30.0	38.0	32.0	—	—	—	—	—	1370	1410	12
13	40.0	30.0	28.0	—	—	2.0	—	—	1220	1435	13
14	40.0	36.0	24.0	—	—	—	—	—	1330	1445	14
15	45.0	30.0	25.0	—	—	—	—	—	1250	1370	15
16	50.0	34.0	16.0	—	—	—	—	—	1275	1425	16
17	54.0	40.0	5.0	—	—	1.0	—	—	1325	1575	17
18	60.0	25.0	15.0	—	—	—	—	—	1260	1325	18
19	60.0	30.0	—	—	30.0	—	—	—	1095	1325	19
20	65.0	28.0	—	—	—	2.0	5.0%	—	1385	1445	20
21	65.0	20.0	15.0	—	—	—	—	—	1235	1310	21
22	70.0	20.0	10.0	—	—	—	—	—	1275	1360	22
23	72.0	28.0	—	—	—	—	—	—	1435	1435	23
24	75.0	22.0	3.0	—	—	—	—	—	1365	1450	24
25	75.0	20.0	5.0	—	—	—	—	—	1350	1425	25
26	75.0	—	25.0	—	—	—	—	—	1300	1345	26
27	80.0	16.0	4.0	—	—	—	—	—	1360	1490	27
28	85.0	—	—	—	—	—	15.0	—	1745	1760	28

Courtesy, Handy & Harman

portion which is still solid. This has a very important and practical bearing on brazing. Thus, let us consider the behavior of two alloy types — type 3 which has a relatively narrow temperature range and is very close to a eutectic composition, and type 4 which has a wide melting range.

If these alloys are placed in a joint and the assemblies are heated slowly within the furnace, according to Handy & Harman[2], alloy type 4 will start to melt at 1125° F with about 50% of the alloy flowing readily along the seam. However, a skull (term for "skeletal residue") of high melting point is left behind. Since the low melting portion of this alloy has flowed away and is no longer present to dissolve the remainder, the skull will persist even above the true flow point. This separation of the liquid portion is commonly called "liquation". On the other hand, alloy type 3 will melt completely and quickly within its narrow temperature range and the entire quantity of the alloy will flow, leaving no trace of skull.

If the two joints mentioned above had first been pre-heated to a temperature above the flow point of the two alloys under consideration, and the brazing alloy were hand fed into the joint, there would be no time for liquation to occur. Thus, under these conditions, the two brazing alloys would behave very much the same.

Should the brazing alloy be pre-placed within the joint which is heated gradually, the eutectic type alloy (No. 3) is preferred due to the absence of liquation. However, if a wider melting range alloy (No. 4) is used, the low melting constituent will flow at the melting temperature of this alloy while the remainder will form a skull. Since the skull is ineffective in bonding, and on the basis that the liquid portion of this alloy is about 50%, a greater amount of brazing alloy is required to obtain equal bonding strength when compared to the eutectic alloy type.

However, according to Handy & Harman[2], an alloy with a wide melting range is preferred where the fit of a joint is poor and it is desired to bridge over the gap or lay a fillet. In this case, the skull that is left serves a useful function of "staying put". Such an alloy has a mushy consistency in the melting range, that facilitates work of this kind. Thus, alloy type No. 2 or No. 4 (which have a wide melting range, sluggish flow characteristics and are of a mushy or plastic consistency in the melting range) will facilitate building up, and bridging or filleting operations.

The property of wetting has been demonstrated to be an important requirement in obtaining a satisfactory bond. Besides cleanliness of joint and the use of a brazing flux, another factor that would influence wettability is the molten brazing alloy. Apparently, the wetting properties of the brazing alloy are dependent on whether or not one of the components of the molten brazing alloy will alloy, at least superficially, with the workpiece. As an example, let us consider a soft solder. Lead is incompatible with iron, and therefore, does not wet iron. However, if tin is added to produce this soft solder, the tin will provide the proper wetting action by means of alloying and thus obtain a fairly strong bond.

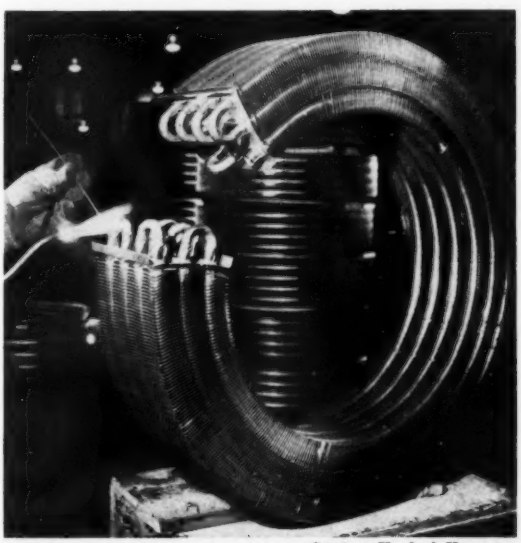
A similar situation exists between a silver brazing alloy and the materials on which they are used.[2] In considering a simple silver-copper brazing alloy, such as alloy type 23, the silver alone does not alloy with iron to any appreciable extent. Nor does it alloy with nickel, cobalt, tungsten and chromium. On the other hand, copper does alloy with, and wets, iron and many of the high refractory alloys at high temperatures, but simple alloys of copper and silver are not very effective on iron or the refractory metals at low temperatures. Thus, alloy type 23 should not be used on steels, stainless steels, chromium alloys, or cemented carbides, except when the presence of zinc or cadmium can be tolerated.[2] Where the eutectic temperature of 1425° F is acceptable, alloy type 23 will produce satisfactory joints in copper, silver and gold alloys.

Both zinc and cadmium alloy strongly with iron even at low temperatures, and, in addition, will lower the melting and flow temperatures of the copper-silver alloys. Both of these elements are therefore used with copper and silver to form alloys that can be used at relatively low brazing temperatures with many commercial ferrous and non-ferrous metals. A disadvantage of these two elements within a brazing alloy is their volatility and readiness to oxidize that lead to a change in the characteristics of the alloy when applied at excessively high temperatures. In the manufacture of x-ray and radio tubes, this objectionable characteristic is circumvented by the use of alloy type 7; here, tin replaces the zinc and cadmium as the wetting agent. This alloy has a comparatively high flow point. However, where a lower temperature brazing alloy is required, type 19 is frequently used; this alloy has a relatively high silver content. It should be emphasized that alloys containing zinc will wet ferrous metals more effectively than will those containing tin; and, when zinc can be tolerated, it is preferred.

Stellites, cemented carbides, and other high tungsten and refractory alloys require a brazing alloy that has a small percentage of nickel, as exemplified by alloy types 2 and 13.[2] The nickel content, from 2 to 3%, is the effective element in promoting wettability. For higher temperature applications on these refractory alloys, manganese is used to promote wetting and bonding; examples of this type of brazing alloy would be types 20 and 28. Alloys that contain a small percentage of nickel improve resistance to corrosion under certain conditions as compared with brazing alloys that contain no nickel, and are particularly recommended where brazed joints in stainless steels are to be exposed to salt water corrosion.[2]

The discussion thus far on wettability presupposes (a) the use of a flux that will dissolve any oxides formed during the temperature of brazing, or (b) the use of a furnace atmosphere that will serve to prevent the formation of these undesirable oxides. This will keep intact a clean metallic surface at the time it comes in contact with the molten braze alloy. However, brazing alloy type 5, which has 5.0% phosphorous within the analysis, is used extensively for the brazing of copper and copper base alloys without the necessity of a flux. This brazing alloy is not recommended for bonding steel since a brittle iron phosphide will form. In the use of this brazing alloy in bonding a copper base alloy, a portion of the phosphorous will oxidize and in so doing reduces copper oxide; and, in addition, the oxide of phosphorous thus formed (P_2O_5) will act as a flux to dissolve any remainder copper oxide which may have formed.[2] In other words, this alloy type is termed a self-fluxing brazing alloy. Where the use of a flux is not objectionable, somewhat better results are obtained with it.

Although hand feeding of a brazing alloy is used to a considerable extent in the gas brazing technique, as exemplified in Figure 1, the preferred and most widely used method is pre-placing the alloy which considerably aids in obtaining the maximum speed and economy for brazing on a large volume basis. The advantages usually given for pre-placing the



Courtesy, Handy & Harman

Fig. 1. Hand feeding brazing rods to obtain leak tight refrigeration coils. Brazed joints are tested hydrostatically at pressures which expand tubes and assure excellent thermal contact with fins.

Courtesy, Aluminum Co. of America

Fig. 2. Examples of preform types available commercially. These low-cost preforms save operator time and provide greater assurance of a uniform bond.

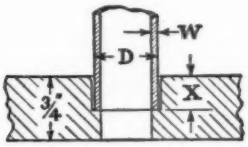
brazing alloy include (a) economical use of brazing alloy per joint; (b) uniform flow of alloy within the joint; (c) use of the minimum amount of alloy required for adequate joint strength, resulting in minimum finishing costs; (d) increased speed of assembly, permitting a steady flow of finished parts on automatic or semi-automatic equipment; and, (e) elimination of the human element, and the production of top quality joints with unskilled labor.

The best form of alloy to use in any specific case depends mainly on the type and shape of the joint. The size of the alloy wire to use, or the thickness of flat stock, depends on the extent of the joint in length, depth, and clearance. In using a pre-placed alloy form, Figure 2, the important considerations would include (a) provision of proper joint clearance; (b) provision of sufficient pressure on the joint to permit the brazed parts to settle when the alloy flows; and (c) proper venting to permit the escape of gases formed in preheating, together with flux displacements by the molten alloy. In this way, gas pockets and flux inclusions in the finished joint are minimized.

Proper design is mainly a question of using the right type of joint and providing the proper clearances. There are two basic joint designs, the butt and lap joints. From these, five variations can be obtained which singly or in combination encompass all types of joint design.[1] The butt joint can be used with good results where the double thickness of a lap joint is undesirable. Modified butt joints offer many advantages in joining both flat and tubular members. To obtain the best results, the joint surfaces of a butt joint should be cut square and parallel to assure proper alignment and provide a uniform clearance over the entire joint area. Component parts should be held to main-

A. Depth of Shear (Lap) in *Tubular* Products

$$X = \frac{W(D - W)YT}{LD}$$



where:

X = the depth of lap or shear area
W = wall thickness of weaker member
D = diameter of shear area
Y = factor of safety
T = tensile strength of weaker member
L = shear strength of silver brazing alloy

Example: What depth of lap is required when joining ¾" copper tubes with 0.064"

W = 0.064"
D = 0.75"
T = 33,000 (annealed copper)
Y = 5 (this value is appropriate for this thickness of tube sheet. A smaller factor of safety would be satisfactory if, for some reason, the length of the lap were limited)
L = 25,000 psi (this is arbitrary minimum value which can be expected from alloys containing appreciable amounts of silver)

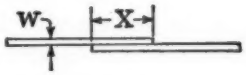
Thus:

$$X = \frac{0.064 \times (0.75 - 0.064) \times 5 \times 33{,}000}{25{,}000 \times 0.75}$$

$$= 0.386" \text{ lap}$$

B. Depth of Shear (Lap) on *Flat* Products

$$X = \frac{YTW}{L}$$



where:

X = depth of lap or shear area
W = wall thickness of weaker member
Y = the factor of safety
L = shear strength of silver brazing alloy

Example: What length of lap is necessary when joining 0.050" annealed Monel sheet to a metal of equal or greater strength?

W = 0.050" L = 25,000 psi Y = 4
T = 70,000 (annealed Monel sheet)

Thus:

$$X = \frac{4 \times 70{,}000 \times 0.050}{25{,}000} = 0.56" \text{ lap}$$

Courtesy, Handy & Harman

Fig. 3. Method of computing depth of shear (lap) on tubular and flat joints.

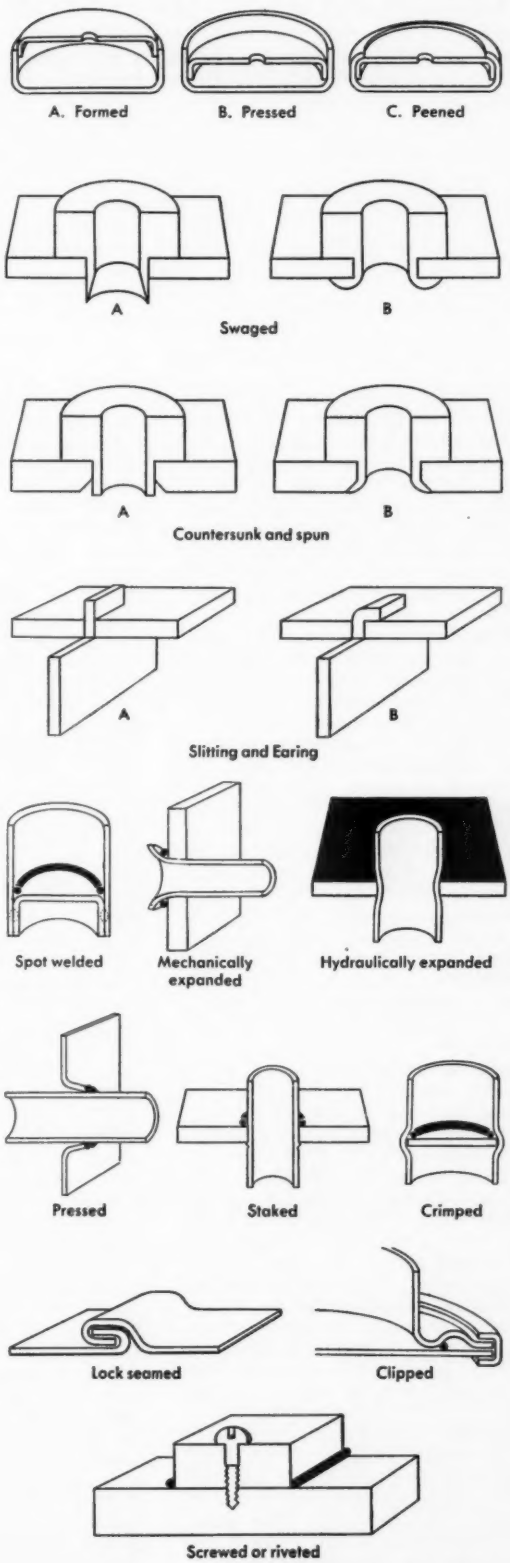
tain their proper relation during the brazing operation. Scarf joints, a special form of butt joint with the joint surfaces cut at an angle less than 90°, give high strengths without increased thickness on such work as joining band saws, fabricating large copper pipe, and tank construction.

The lap joint, which is frequently termed a shear joint, is the most satisfactory and the most generally used since the lap or shear area can be varied to meet any desired factor of safety. Joints can be held in place readily and, in the joining of flat parts, an easily applied pressure will insure complete bonding. On tubular joints where pressure cannot be applied, it is important that correct tolerances be incorporated in the initial design.

The amount of lap depends on the strength of the metal being joined and the factor of safety desired. A good rule-of-thumb giving an ample factor of safety is to use a lap that is three times the thickness of the thinnest joint member. For those who are interested in a close approximation, the desired lap can be computed by the formulae given in Figure 3.

Let us consider a specific example, as given by Handy & Harman[1], in computing the depth of shear for a tubular joint. Substituting the values given into the formula, the depth of shear that is required is 0.386". This is the X value. The formula for flat joints is given in Figure 3B; the procedure for calculation is similar to the example given.

Where the entire assembly is to be subjected to a furnace or salt brazing technique, it is essential to support each individual assembly during the brazing operation. The ability to self-jig component parts is invaluable since, if the use of jigs is essential, especially where the fixture is of a different material than that brazed, a difference in rates of expansion may exist and cause some misalignment. Self-jigging is also an economic advantage since (a) it eliminates the operations of placement and subsequent removal of jigs; (b) a fuel cost savings is realized since the jigs need not be heated; (c) the cost of maintenance and replacement of jigs is eliminated; and (d) contamination of the brazing bath, in the event of salt brazing, is minimized. Suggested methods of self-jigging are given in Figure 4. end



Courtesy, Aluminum Co. of America

Fig. 4. Suggested methods of supporting assemblies without jigs or fixtures.

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APPLICATIONS OF CHEM-MILL TO AIRFRAME STRUCTURES

by L. G. Hall
Supervisor, Fuselage Group
Engineering Department
NORTH AMERICAN AVIATION, INC.
Los Angeles, California

FROM THE AIRFRAME DESIGNER'S POINT OF VIEW, the introduction of the Chemical Milling process received an enthusiastic welcome. In fact, at North American Aviation the engineers' response was so intense that a restraining order had to be issued to let Manufacturing expand Chem-Mill facilities to catch up with the designers' requirements.

Since the process is somewhat new, it isn't exactly "sold" to Manufacturing, in the sense that they are urging Engineering to increase the number of Chem-Milled parts. Furthermore, there is occasional reluctance inside the Engineering and other departments to accept Chem-Mill designs without a "show me" attitude. When this attitude is evident, it usually is necessary to make two designs for a direct comparison and evaluation. There has somehow been a general opinion that Chem-Mill is primarily a weight-saving process. It does this and more, as will be shown later.

The following applications show some of the Chem-Mill process' many advantages.

Chem-Mill after Forming. This is probably the best application of the process that has been tried to date. It is usually not possible or economical to machine parts after forming. Stretch forming, for example, is best done on material that is uniform in cross-section. Chem-Mill permits this, and any etching or tapering of the formed part is a simple following operation. Such parts might be skins with raised lands, for either higher allowables for fasteners in thin sheets or a stiffening effect in the skin panel. The following example illustrates the fastener problem:

A panel with a shear flow of 2,050 lbs/in would require 0.063" 75ST aluminum alloy clad sheet. This assumes a panel small enough to obtain a full shear allowable. The panel edge attachment would require two rows of rivets, asuming no rivet factor. However, the following combinations of rivets in a single row with thicker Chem-Milled edges on the panel would satisfy the requirement: $\frac{3}{16}$" dia flush high-shear rivets machine countersunk in 0.071", $\frac{3}{4}$" on center, or $\frac{3}{16}$" dia high-shear rivets dimpled in 0.071", $\frac{27}{32}$" on center. If the panel were a removable door where a single row of screws would increase access, the following combination would apply: AN508-10 flush screw, machine countersunk in 0.090", $\frac{3}{4}$" on center.

The example merely illustrates what is generally true of aircraft with thin skins — the edge fastener is more critical than the panel. If a constant thickness is used, the panel is either overweight in order to get adequate fastener strength, or two rows of fasteners are required. A Chem-Mill panel, however, may be designed to be used with a single row of rivets. The current design trend in fighter-type aircraft is toward heavy skins and so the fastener problem today is not so acute as it possibly could be, but future designs using thin skins of steel or titanium will reverse the trend again. In all cases, however, Chem-Mill gives the designer an infinite range of skin thickness, without the limitation imposed by standard gauges.

The service history of the F-100 duct structure further illustrates the example. For the initial drawing release of the duct skin, a thin gauge of 75ST clad aluminum was used with dimpled attachments to the duct frames. The first request for change came from Manufacturing because of excessively long assembly time. The duct was made in upper and lower assemblies, and when put into the fuselage assembly, they were first positioned, then drilled along the duct splice, removed from the assembly to be dimpled, then put back into the jig to be riveted. The solution was to add a splice plate inside the duct, sufficiently thick to permit a machine countersink. The Thermodynamics Group was reluctant to permit the change, but finally accepted it (Fig. 1).

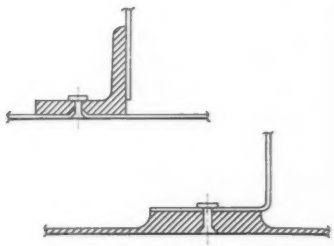


Figure 1

Then as the first plane began to accumulate ground run-up and flight time, the duct skin started to crack through the dimples, and was repaired each time by adding a doubler inside the duct. At an early change point, the duct skin was changed and Chem-Mill lands were added at the frame attachments, eliminating all dimples. The result was a smoother surface which improved duct air flow, eliminated all cracking in service, and speeded up assembly time. The smoother air flow was primarily the result of the elimination of "pillowing" between frames caused by distortion of the skin after dimpling.

Where the ducts were spliced, a change to a Chem-Mill land was considered but discarded because an internal splice plate gave the shop more latitude in the gap tolerance, and thus eliminated a trim operation (Fig. 2).

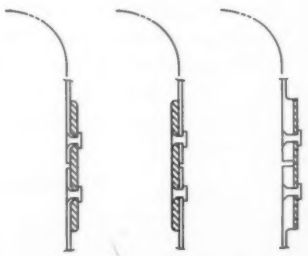


Figure 2

From the recent Society of Automotive Engineers' National Aeronautical Meeting.

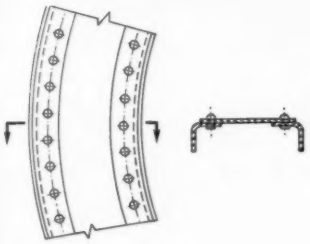


Figure 3

The same problem is present in fuselage skins as well as ducts, and in some fighter aircraft the identical approach of using thin skins and etched lands has worked out very well.

An additional advantage in the use of frame cap material in the skin land, is the increase in flexibility of the frame during assembly. Since the formed skin will be stiff and somewhat inflexible, any variation in contour of the frame can be taken up by pulling the frame's flange into contour during riveting.

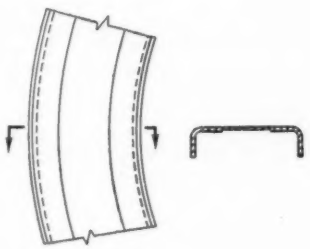


Figure 4

For a comparison between a structural frame assembly of conventional construction and a Chem-Mill frame the following may be shown: A conventional frame assembly (Fig. 3) has three routed parts, two forming operations, and a riveting operation. The Chem-Mill frame assembly shown in Figure 4 has one routed part, which is then formed and etched. If desired, a second etch could taper the flanges, at low cost and with an appreciable weight saving.

Chem-Mill in Sandwich Applications. Another good design application is in honeycomb sandwich construction, particularly where fasteners are used (Fig. 5). For protruding head rivets, the thicker land provides adequate bearing, and in flush riveted joints the necessity for dimpling is eliminated. Dimpling along the edge of a honeycomb panel is particularly bad because the dimpling would have to be done before bonding, and the riveting after bonding. The chances of the dimples matching or being free of adhesive after bonding is pretty remote. In any case, the machined countersinks in the Chem-Mill facings would reduce assembly time. For contoured honeycomb sandwich parts, the elimination of dimpling is even more advantageous. Since the fit between the skin and core is critical, any operation in the fabrication process which would tend to alter the skin shape after forming is bad. Dimpling tends to stretch and oil-can the sheet, and machined countersinks in the Chem-Mill panel can be added after bonding and will eliminate these adverse conditions.

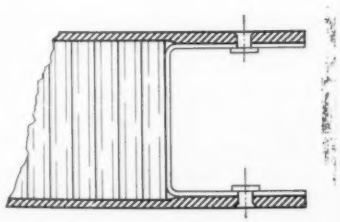


Figure 5

Elimination of Minimum Thickness Restrictions. Chem-Mill permits a reduction in cross-sectional area, and thus weight, of extrusions, forgings, and formed parts which would otherwise be thicker because of the limitations of the extruding, forming, or forming process. Tapering of skins and extrusions is readily done by the Chem-Mill process. In the case of a formed and tapered extrusion such as a rib cap (Fig. 6), Chem-Mill shows to particular advantage. Using normal machining methods before forming would result in a part difficult to form, as stretch forming tapered parts, though possible, is very costly. If the part is formed first, machining the taper on the formed part is difficult and impractical.

By utilizing the Chem-Mill process, however, the extrusion can be formed as a uniform area section first, then tapered by a timed immersion into the etching solution. Consider a 2024 aluminum alloy sheet to be formed with a desired 4" inside radius on a stretched ⅞" flange. To eliminate hand work after forming, a thickness of 0.064" is required. If the necessary structural thickness required after forming, however, is less than 0.064", the difference can be removed by etching.

In the case of stretch forming, the thicker the material the less likelihood of cracking during forming; and, with shrink flanges, thicker material has less tendency to buckle. Therefore, form it thick and Chem-Mill it thin (Fig. 7).

Increased Tapering Possibilities. Airspeed pitot static booms on some current aircraft are from 6' to 12' long, and are generally made from aluminum alloy tubing tapering in wall thicknesses from ⅜" to 1/16". Depending on quantities involved, the taper may be either machined or redrawn from constant wall to tapered wall thickness. Although cost comparisons are not available, tapering by the Chem-Mill process is at least competitive, especially when a tube is not only tapered, but bent as well.

Reduction of Welding Problems. Aircraft with welded skins are now produced to a limited extent, but currently are being designed extensively. Here the designer will find

Figure 6

Chem-Mill the answer to a number of problems. At welded butt joints, a raised land may be used to compensate for the reduction in allowables at the weld. At a welded joint

Figure 7

between a comparatively heavy structure such as a frame or longeron, and a thin skin, a raised land on the skin of comparable thickness is required to obtain a good weld joint (Fig. 8).

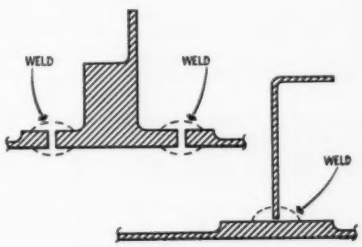


Figure 8

Decreased Costs. In comparing the relative costs of Chem-Milling and conventional machining, it would be misleading to select any one part as an example and state that it would cost this much to produce by one method and that much by the other.

Chem-Milling and conventional machining should be considered as complimentary, not rival, methods of producing parts. Each has its parti-

cular advantages and disadvantages, its obvious potentialities and limitations. These factors should be evaluated when a part is being designed.

In general, Chem-Milling can claim the following advantages as far as cost is concerned: labor rates are lower; tooling requirements are insignificant; investment in capital equipment is less; and incorporation of detail parts into onepiece designs can effect a variety of savings in engineering, planning, tooling, and manufacturing.

To summarize:

- Aluminum, titanium, magnesium, and many alloy steels may be etched using the Chem-Mill process.
- The physical and mechanical properties of the stock are not materially altered by the process.
- Surface irregularities such as dents, scratches, etc., are amplified, and gauge variations are reproduced by the process.
- Tolerances in thickness may be as low as ±0.002" plus the actual sheet tolerance.
- The Chem-Mill process permits weight reduction.
- For stiffness, and elimination of parts, etched bands and stiffeners can be produced integrally with the sheet.
- The process is not recommended for use on castings.
- The etched fillet radius is approximately equal to the depth of cut.
- Panels may be designed with varying depths by progressively unmasking during etching.
- Chem-Mill may be performed before or after forming.
- Tapering is possible by proper timing during immersion.

It is quite evident that the Chem-Mill process is here to stay. Its use in the aircraft industry has increased rapidly since its introduction, and as the process becomes more widely known it will undoubtedly be used by other industries. The process has limitations, but its general acceptance indicates a wide range of adaptability. end

For Finding Articles

in Previous Issues of 1957

See

Cumulative Editorial

Index

Page 190

A Plan for Safer Plants

Analyze the Safety of Jobs

Third of a series prepared with the cooperation of the Greater Cleveland Safety Council

AN ANALYSIS OF JOB SAFETY can bring two returns, Cleveland safety experts agree: it can be an effective injury prevention technique, and it can point the way to production-line cost reductions.

The supervisor undertaking the program must consider each job carefully and be familiar with the operating procedures and safety factors involved in the jobs under study before beginning the analysis. Here is the plan recommended by the Cleveland Safety Council:

1. Sort injury investigation reports (see TOOLING & PRODUCTION, June 1957, page 101) for non-disabling as well as disabling injuries for the past 12 months into departments and occupations.

2. Concentrate on those jobs in each department which have had the greatest number of accidents.

3. Prepare a work sheet, with columns for (a) Job Elements, (b) Hazards-Unsafe Acts, (c) Hazards Eliminated, and (d) Employee Safety Training.

4. In column (a), break down the job into each element or step in the operator's working procedure.

5. In column (b), list for each step in the working procedure all potential hazards and unsafe acts which might result in injury.

6. In column (c), list the hazards eliminated and methods used to accomplish this. At this point, consider any changes which will serve to reduce hazards, such as revisions of material handling procedures, or installation guards, etc. If the supervisor doesn't have the authority to proceed with suggested changes, he should clear them with the proper plant official.

7. In column (d), recap the items in column (b) less the items disposed of in column (c). Items listed in this column provide the basis for employee safety training.

8. Check the analysis with the injury investigation reports on the job to make certain the causes of the injuries on the particular job have been comprehended by the analysis of the job.

9. Review the analysis form with the employees assigned to the job, so they can contribute ideas to it and also to increase their interest in the analysis and resultant job safety.

10. If future injuries occur on the particular job analyzed, the job analysis should be reappraised to determine whether or not a revision is necessary. Revisions should be made as required.

Schedule first those jobs at which most of the department's injuries occur. Then periodically analyze other jobs because usually they too can be improved.

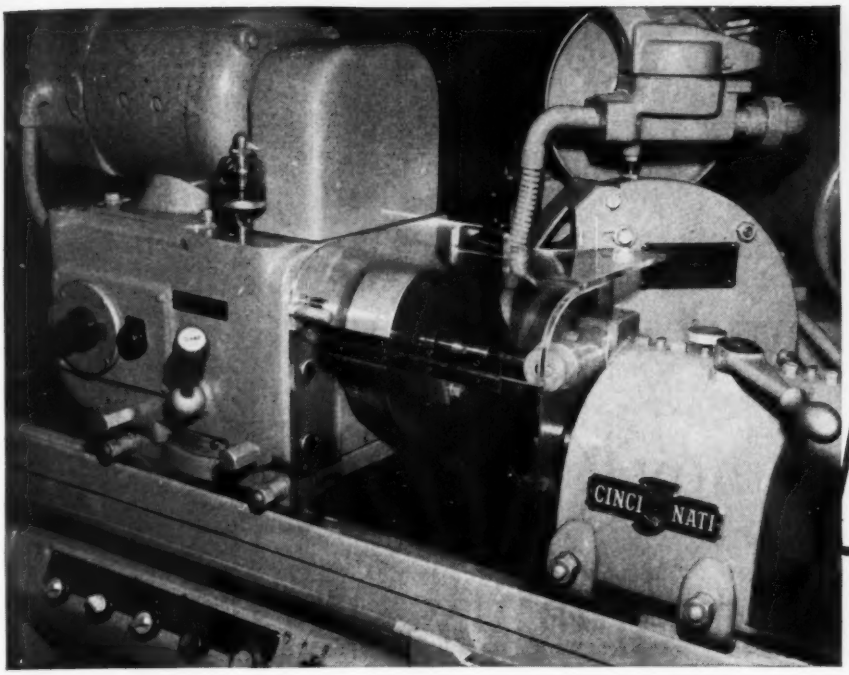
Besides spotting past and future safety hazards, the job analysis' step-by-step report on job procedures can help show where operations can be modified to make them more economical.

A periodical inspection of department tools, equipment, and other facilities is still another way to make the department a safer place in which to work. It is well for management to plan such trips in advance, so the workers will know it is being made, and so the management inspection team members will know exactly what they are to look for. When the inspection trip is completed, corrective action, if needed, should be taken as quickly as possible. This tends to increase the workers' safety consciousness and boost their interest in the company as a whole.

Seven Steps to Safety . . .

1. Insist on safety.
2. Assign someone to help on details.
3. Locate trouble spots.
4. Make the job safe.
5. Control unsafe habits.
6. Keep simple records.
7. Get employees into the act.

(By the National Safety Council.)



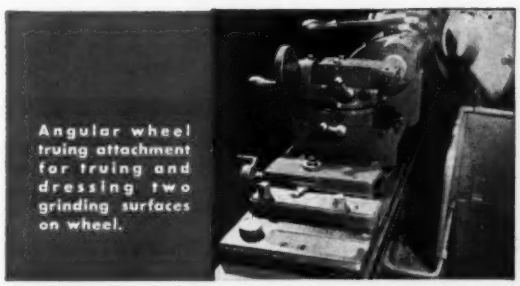
CINCINNATI FILMATIC 10" UNIVERSAL GRINDER set up to grind simultaneously diameter and shoulder of titanium trip dogs. Wheel runs at 5000 fpm for these titanium parts.

FILMATIC

This Universal Grinder Gives You Both

Versatility and Production

Can your universal grinders handle an occasional high production job at a reasonable cost? It's routine work for the CINCINNATI® FILMATIC® 10" Universal illustrated here . . . grinding the diameter and shoulder on large quantities of small titanium parts. ¶ To obtain the highest quality finish on the two surfaces, the grinding wheel has been transferred to the right-hand end of the spindle, and the wheelhead swiveled about 45°. Automatic infeed aids the operator in maintaining a uniformly high rate of production. An angular truing fixture simplifies the truing and dressing chore. The 10" Universal's extra measure of power is a big factor in production, too. And in addition, the wheelhead swivels 180° and 220°, upper and lower, respectively; headstock swivels 180°; headstock speeds are infinitely variable 60 to 600 rpm. Sounds good for your shop, doesn't it? Sweet's Machine Tool File contains brief specs.; for complete data, write for our catalog No. G-577-5.



Angular wheel truing attachment for truing and dressing two grinding surfaces on wheel.

CINCINNATI FILMATIC 10" Universal Grinding Machine. Complete information in catalog No. G-577-5.

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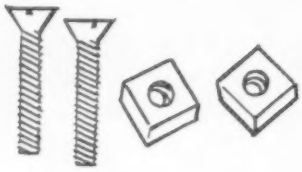
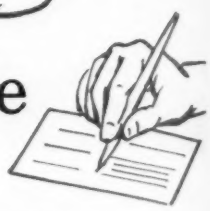
CIRCLE INFORM-A-GRAM KEY NO. 101

If you assemble products with 2 or 20 fasteners  Thor Multiple nut setters and screwdrivers can save you money and give you better quality. Write  today for Thor's Multiple story— it's

This Thor Multiple is setting 4 bolts at one time

THOR POWER TOOL COMPANY

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Send me, without charge, Thor's 24 page automation manual on multiple nut setting and screwdriving. I understand this manual answers all the questions about multiple operation in large or small assembly set-ups.

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by ROGER PRICE

J&L

Bench Model BC-7C

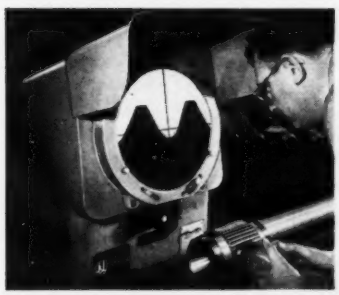
Floor Model FC-30

Floor Model FC-14

"PUSH-BUTTON OPERATION"

This is my brother Sam, the surgeon, who is affectionately known as "Old Blood and Guts". Sam's not only a big-time operator, he's also quite a comic. He's shown here ringing for the elevator to the Rainbow Room, where he has a date with a steak. Sam has always loved "gagging it up". This helps explain his: 1. Performing a frontal lobotomy on a Univac he'd diagnosed as schizophrenic. 2. Getting bagged by the gendarmes for "pretending" to hold up a gas station. 3. Being gaffed by the Medical Board for having forged credentials. In a recent letter from Atlanta, Sam complains that "everyone takes things too seriously nowadays . . . the universe is out of focus."

I replied, to wit: "Sam, you shouldn't talk that way. If you only knew how Jones & Lamson Optical Comparators are improving quality control and speeding production throughout industry by rapidly and accurately measuring and inspecting all sorts of parts and objects, you'd agree with me that things are in perfect focus." Then I added, "Sam, old man, you evidently don't realize that Jones & Lamson Optical Comparators are wonderfully versatile. They're ideal for either long runs or small lots, and they can perform many types of inspections that just aren't possible by any other method. Furthermore, they're precise to .0001", they're available in 11 different models, in both bench and floor types, and production men everywhere think they're peachy." That's what I said. Say — by the way, if *you're* interested, just send this coupon. We'll supply complete details.



OPTICAL COMPARATORS On the Job . . .

Inspecting threads on helicopter rotor shafts at Indiana Gear Works, Indianapolis, Indiana

This special thread form is designed to withstand the heavy stresses and strains developed by the rotation and lift of the main rotor shafts in today's helicopters.

A special J&L comparator is used to inspect the threads — to make sure the critical radius at the root is within tolerance. Rugged staging areas of precise machine tool construction, together with a truly balanced optical system, insure the success of this operation.

"The originator of machine tool standards in optical inspection"

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vt., U.S.A.
Please send me Comparator Catalog 402-C, which describes the complete line of J & L Optical Comparators.

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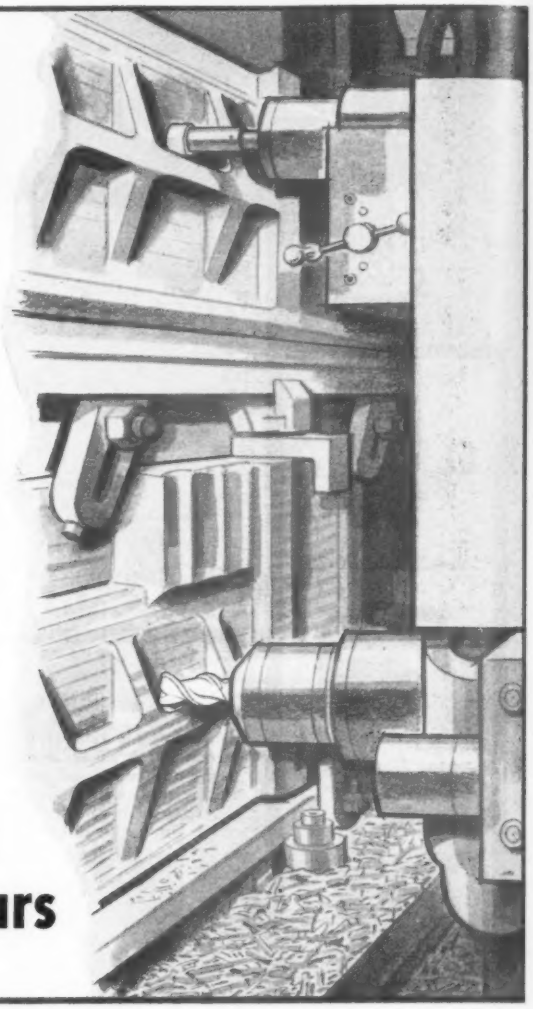
CIRCLE INFORM-A-GRAM KEY NO. 103

CLEVELAND
Hy-Spiral End Mills



cut the cost of milling 75 ST aluminum wing spars

CLEVELAND Hy-Spiral End Mills have increased production from 12 to 37½ spars per grind. They have eliminated tool breakage, and have greatly reduced the build-up on side and end cutting edges. ◈ CLEVELAND Hy-Spiral End Mills were developed primarily for aircraft forging tracer milling. They have the right combination of rake, relief and helix angles to provide the proper shear cutting action for fine finishes and long tool life in non-ferrous materials. They also give excellent results in many ferrous applications. ◈ For full information about these *high performance* end mills, contact our nearest Stockroom, or . . .

Request your copy of this helpful, informative book that describes the complete line of CLEVELAND End Mills

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CIRCLE INFORM-A-GRAM KEY NO. 104

Automatic Skin Drilling Machine

To replace costly, slow hand methods, Grumman Aircraft Corporation designed and fabricated the "skin drilling machine" shown here.

The production requirement was—9000 holes in aircraft skin assemblies consisting of aluminum corrugated section and skin. Formerly, all holes were predrilled by hand in the corrugations and then transfer drilled into the skin. Now, hand work is reduced to tack riveting skin and corrugation and for a few inaccessible areas.

Operation

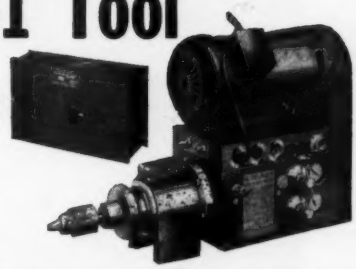
This new machine clamps the workpiece to prevent burring, drills #40 holes usually 5/8" apart and indexes automatically to next position. A chain and sprocket 1 H.P. drive, regulated by template and photo-electric controls, moves the drill head and lower ram assembly along parallel rails from hole to hole. The workpiece remains stationary. Row on row indexing is done by an air driven gear and rack assembly. 50 to 55 holes per minute, or about four hours per assembly, are now achieved.

Savings

In addition to the remarkably high time savings of 7½ hours per workpiece, other benefits include reduced jig time and number of jigs, extended drill life and the elimination of operator strain. The drill head used is a Dumore 20-011, self-contained with a rotary vane compressor. This is but one of the many automatic drill units made by Dumore for automation purposes. For complete information, write The Dumore Company, 1304 Seventeenth Street, Racine, Wisconsin. Adv.

Drill and Tap Automatically with this 2-in-1 Tool

the New DUMORE Series 28 "DRILL-N-TAP" UNIT



Saves Set-Up, Fixture and Service Costs

One of the world's largest farm implement makers, Massey-Harris-Ferguson, uses three new Dumore "Drill-N-Tap" Units to cut costs and increase production on power take-off housings. These units *automatically drill and tap* three holes in two sizes of housings without changing position on the same set-up. A 1"-thick steel plate is placed under the smaller housings for aligning to proper position. Here, the drilling and tapping are done on the same fixture. Drill bushings are simply removed when tapping. *Tap fits into chuck—no extra tapping head is required!*

The Dumore "Drill-N-Tap" Unit is a *driller* and a *tapper* — all in the same automatic machine. Two tools in one — at the cost of only one!

It drills or taps without attachments — no long overhang, or expensive clutches to wear out. Self-reversing motor, electrically controlled, withdraws tap by reversing spindle rotation. You drill or tap *at the flip of a switch!*

Mounts in 3 minutes — anywhere — on job after job for long or short production runs. It doubles the output of ordinary methods with less tool breakage and scrap losses. Simple nose mounting device provides easy installation on less table area. Work mounts close to fixture with little tool travel for faster cycling, less idling time. 10 speeds from 265 to 4900 rpm.

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YOU CAN DO MORE WITH DUMORE DRILL UNITS

DRILLING • TAPPING • BORING • MILLING • FACING • REAMING • CHAMFERING • DEBURRING

DUMORE PRECISION TOOLS

AUTOMATIC DRILL UNITS
TOOL POST AND
HAND GRINDERS

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CIRCLE INFORM-A-GRAM KEY NO. 105

Plymouth Cuts Solder Costs 60%

Automatic Machine Improves Installation of Fuel-Tank Filler Necks

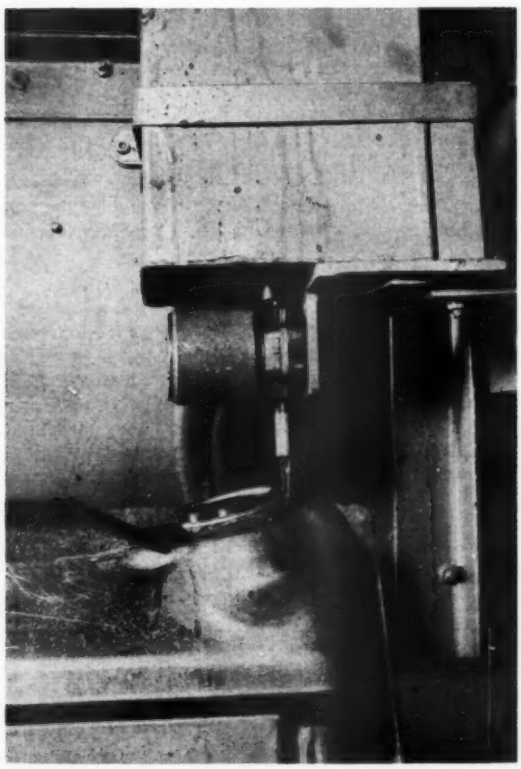
Fuel-tank filler neck assembly is begun by workman who taps filler neck ring into place.

Top half of tank is placed on moving conveyor which carries it into machine. Top and bottom halves of gas tank are later joined by an electric welding process.

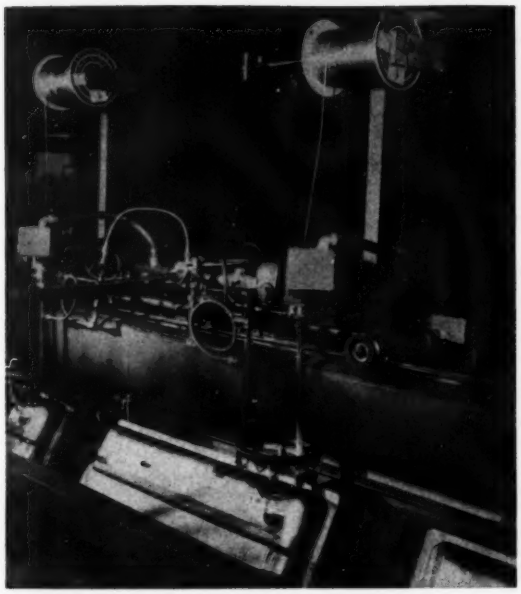
AN AUTOMATIC SOLDERING MACHINE designed to speed installation of fuel-tank filler necks has been introduced at Plymouth's main assembly plant in Detroit.

The machine, created by the Mogul Company specifically for Plymouth, automatically fluxes, pre-heats, solders, post-heats and quenches the filler-neck to the upper half of the fuel tank at a maximum rate of 600/hr.

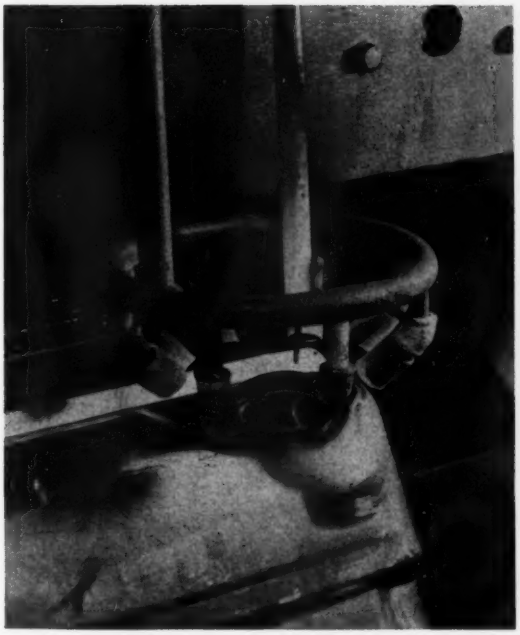
Plymouth plant engineers estimate savings in solder costs alone are as much as 60% with the new machine, while its uniformity of high quality soldering is outstanding.



Movement of tank into machine triggers a switch which releases flux at correct time. Gravity pulls flux around base of filler neck, cleaning exact area to be soldered.



As two soldering terminals work in unison, burners, which ring filler-neck area, heat metal to proper temperature. When correct heat is achieved, electronic device feeds proper amount of solder wire into flame. Solder melts and drops onto filler-neck area, where gravity pulls liquid solder into small openings. Process results in air tight seal around filler-neck.



Close-up of eight gas burners surrounding filler-neck area shows tip of solder wire (center of photograph) being fed into gas flame. Entire soldering process takes but a matter of seconds. end

QUICK DIE CHANGE ECONOMIZES PRESSWORK

DANLY HAS TAKEN another big step forward in the drive toward increasing press productivity. The Danly Quick-Die-Change Presses, just announced, come close to eliminating press downtime for the changing of dies and make possible more economical production of limited-run stampings.

Also see "Pushbutton Die Setting Cuts Downtime," T&P, Oct. '56, p. 166

Presses feature the use of two lower bolster plates, each of which is permanently mounted on a power-driven heavy duty carrier. Carriers roll on rails and can be shuttled into and out of the press through openings provided in the side frames. While the press is in operation with one die, diesetters can be setting up a replacement die or the next die to be used (according to the frequency of part changeover) on the carrier outside of the press.

This permits better scheduling of crane time, with dies moved to and from storage without loss of press time.

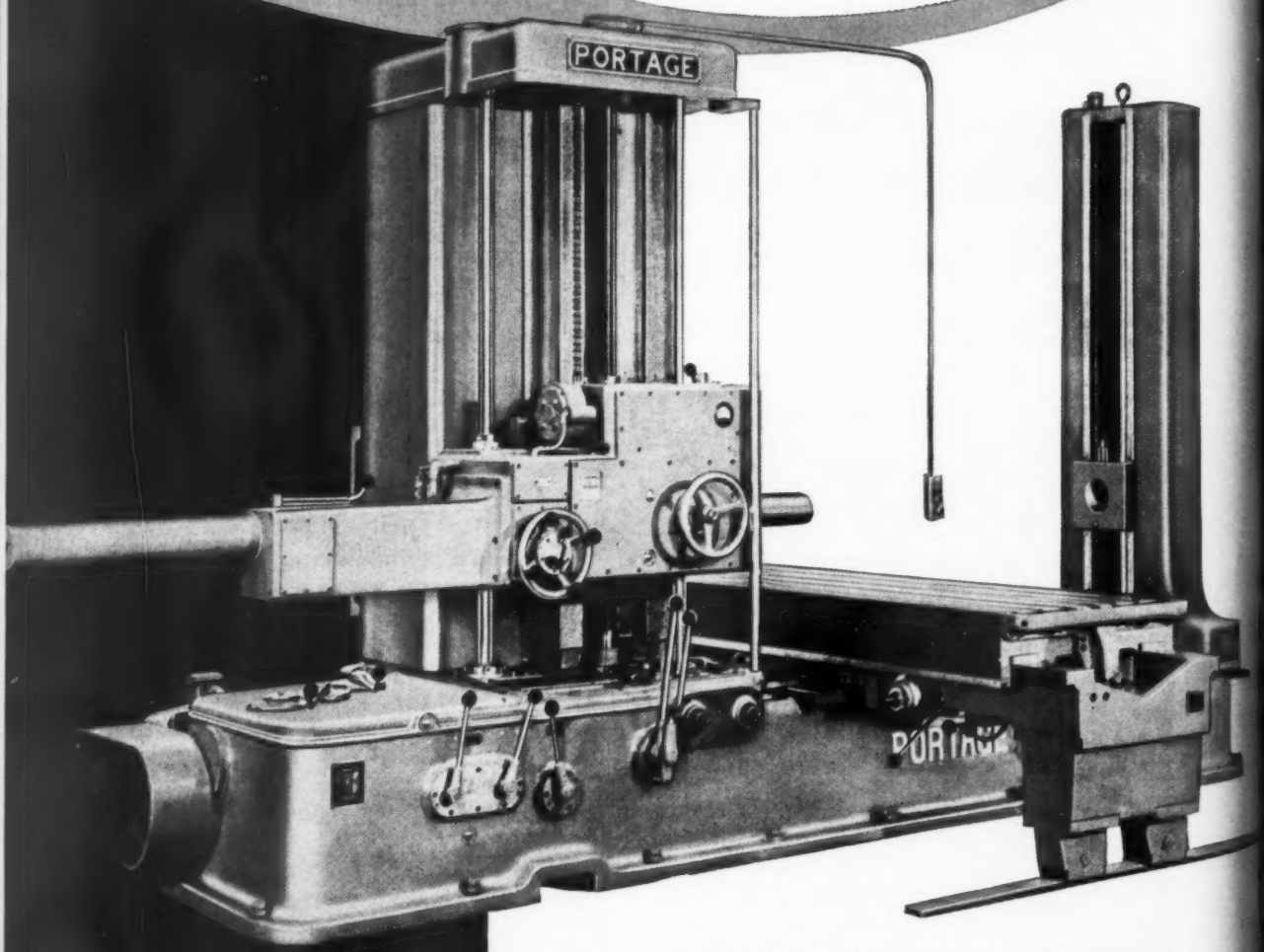
At changeover time, with slide at bottom of its stroke, the upper chamber in each of the pneumatic die cushions is exhausted to drop cushions below the top of the press bed. Die and carriage assembly is unclamped from slide and press bed, and slide is run up. Hydraulic cylinders raise die carrier to track level above locating keys, and this carrier is shuttled out of the press while the other is moved into working position.

The new carrier and die set is lowered onto the press bed and clamped securely to bed and slide. Virtually all operations required in changing the dies are pushbutton controlled.

This method of changing dies permits use of more permanent material handing equipment between presses, provided such equipment also is equipped for fast changeover. (See "A New Concept in Press Automation," T&P, Jan. '56. p. 77).

PORTAGE *Announces...the*

NEW LOOK



The new PORTAGE No. 4 Horizontal Boring, Drilling and Milling Machine has a complete NEW LOOK. A heavier base, column, saddle and head are a few of the new features. The overall "beefed up" machine offers a wider range of versatility. NOW... you can handle the larger work ... with the smallest possible capital investment. Write for complete information.

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CIRCLE INFORM-A-GRAM KEY NO. 108

Parker Majestic

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The Semi-Automatic Internal Contour Grinder

FEATURING

- Extreme repetitive accuracy by means of automatic size control.
- Flexibility of application.
- Modest tool cost for change-over to different parts.
- Minimum set-up time required for change-over.
- Accurate duplication of required cam form.
- Minimum capital outlay required.

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INCREASE PROFIT MARGIN ON FORMED STAMPINGS WITH U. S. MULTI-SLIDES®

Reduce your costs and increase your profit potential! Elimination of secondary operations and handlings result in reduced costs. It is therefore important to produce parts, wherever possible, complete in one machine. The U. S. Multi-Slide, through a combination of built-in motions, allows for the designing of tools to fabricate precision formed metal stampings without secondary handlings.

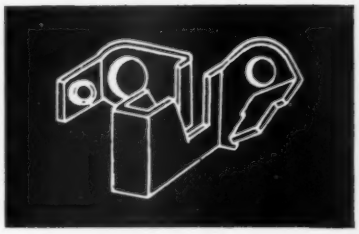
Standard equipment on the machine includes: ram action for cutting, piercing, trimming, embossing, etc.; a four-slide forming position, and a vertical movement for stripping and transferring. Since these movements are part of the machine equipment, it is not necessary to incorporate complicated movements into the dies themselves. The machines are built in four sizes, and on the three larger units it is possible to use two or more rams simultaneously, as illustrated in the sequence of operations drawing below.

Investigate. Ask for a copy of our Bulletin 15-P or send us part drawings or samples for our recommendations.

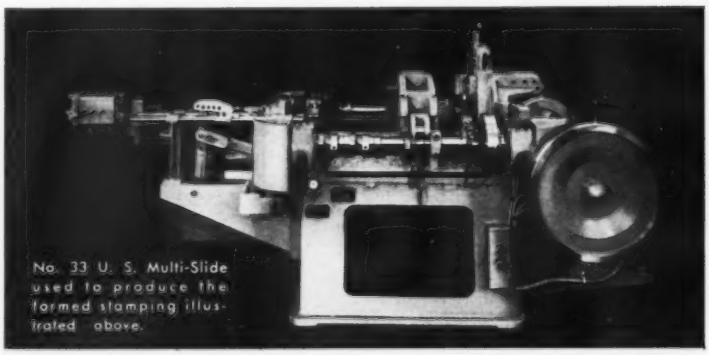
U. S. TOOL COMPANY, INC.

Ampere (East Orange) New Jersey

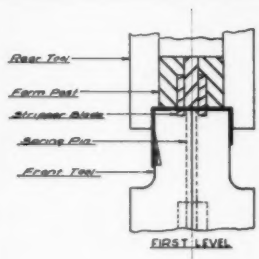
Builders of U. S. Multi-Slides — U. S. Multi-Millers — U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

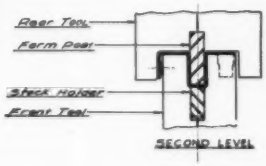


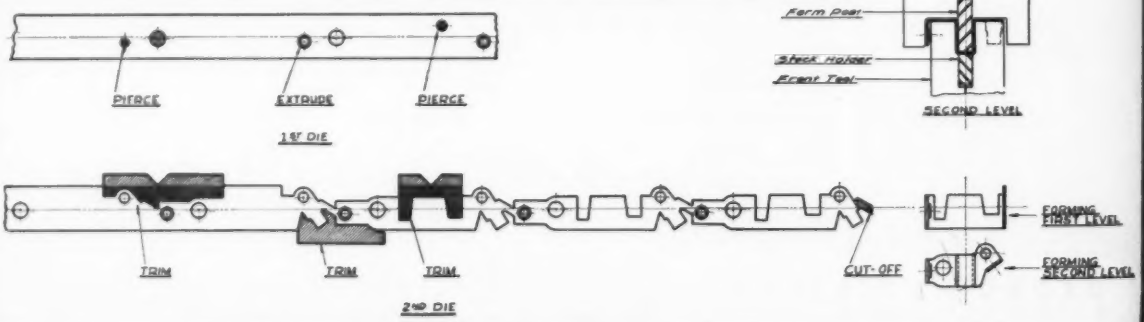
The automotive component shown above is produced complete, without secondary operations, in the No. 33 U. S. Multi-Slide Machine. Drawings below indicate the sequence of stages in the dies and forming positions. Observe the two-level forming position used to complete the piece after cutting off.



No. 33 U. S. Multi-Slide used to produce the formed stamping illustrated above.







"Why substitute? The best metal for screw machine parts is still brass... and it costs less!"

Titan Brass Rod

REDUCED 30%

Price of Titan free-cutting brass rod today is reduced over 14 cents per pound, or 30% from April 5, 1956 . . . from 47.51 cents per pound to 32.87 cents per pound on July 18, 1957.

Be cautious about substitution claims. Remember these advantages of brass:

- Brass is the most easily machined of all metals . . . giving low costs and high output
- Brass allows trouble-free maintenance on screw machines
- Brass has natural fine surface for high polish and ready plating
- Brass gives maximum production efficiency . . . eliminates extra operations
- Brass is corrosion-resistant
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It all adds up. Brass gives you your metal money's worth! And brass costs less. Call Titan today!

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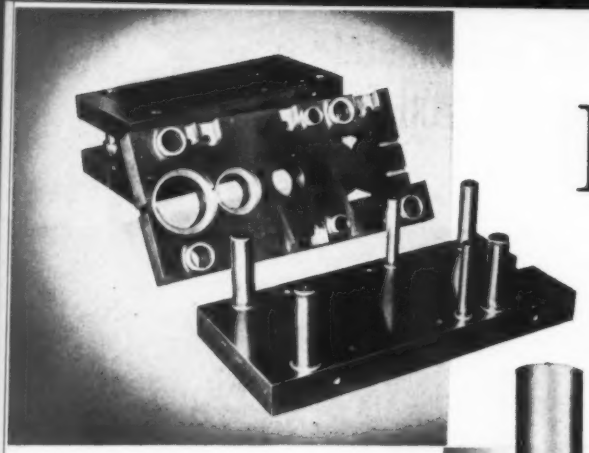
Offices and Warehouses in Principal Cities

TITAN BRASS FOR FORGINGS AND DIE CASTINGS HAS BEEN REDUCED PROPORTIONATELY!



Big or Small

we make them all...

There are no limits on size... thanks to its facilities, Dieco can make special die sets for any press built.

And to speed these die sets to you, we have now made it possible for your local Dieco branch or dealer to give you an on-the-spot quotation on any special die set. Without having to refer back to the main plant, he can save you days on delivery.

Dieco service is not only fast, it's complete. Our branches stock all standard die sets and a broad line of die maker's supplies. For more information call your Dieco dealer or branch or write us directly.

JUST OFF THE PRESS... and yours for the asking: a simple easy-to-use catalog of all standard and special die sets and die maker's supplies.

dieco DIE SETS

E. W. BLISS CO.
DIE SUPPLY DIVISION
Cleveland • Ohio

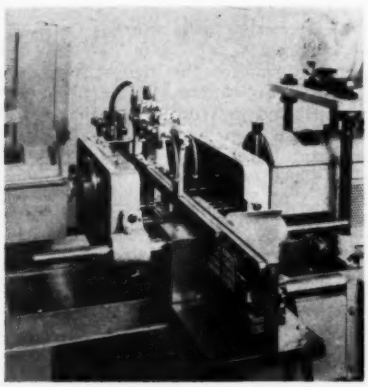
CIRCLE INFORM-A-GRAM KEY NO. 112

SPECIAL MACHINE TAPS 28,800 HOLES/HR

Problem: To tap 3/16" holes (7/16" center-to-center) in either of two different types of brass terminal inserts set in phenol fibre — 40 holes in one part and 20 in the other — and produce 720 completed parts every hour.

That was the problem turned over to Ettco Tool & Machine Co., Inc., drilling and tapping equipment specialists, by a major electrical products manufacturer.

Utilizing standardized Ettco-Emrick components, Ettco engineers built a "special" for the purpose — a basic two-way horizontal automatic lead screw tapping machine, including vacuum mist lubrication and disposal system. This special machine is capable of producing either part at the required production rate.



Parts of either type are hand loaded vertically into a track and pushed forward into work position by means of a hand actuated fixture. When the part is in position, two synchronized horizontal A.T.U. No. 3 lead screw tapping units are actuated. These units, each of which is set up with a 20-spindle multiple head, also have pickup rods to assure error-proof positioning of the parts — a feature that eliminates spoilage and the possibility of tap breakage.

As each part is progressively fed through the two work stations, one completely tapped part, free from oil or chips, is automatically ejected into the tote box. It is because the parts must be dry that mist-fed lubrication is used in this application.

An advantage of this special Ettco-Emrick machine is that after the run is completed, a great many of the components, such as the lead screw tapping machine, cast iron base, wiring system, etc., can be used again for other applications at considerable savings in capital outlay.

BUY U. S. SAVINGS BONDS

MAG-TOOL

Check these Features:

MAGNETIC DRILL PRESS

Operates in **any** position

Entirely portable

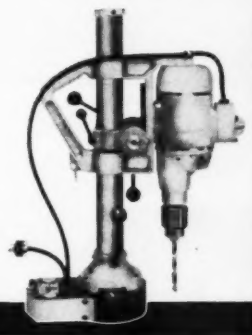
Up to 1½ tons of magnetic holding power

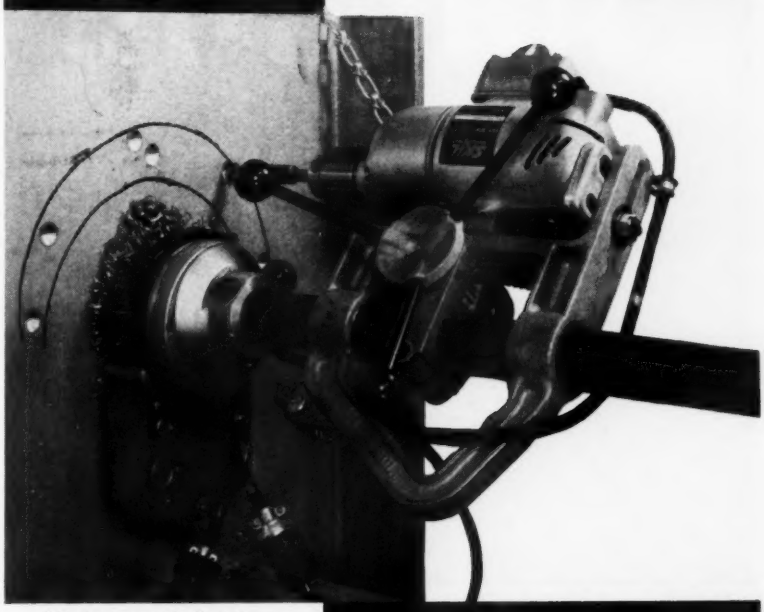
Labor costs cut by up to 95%

Accepts heavy duty electric or air drills

Engineered with MICROMATIC ADJUSTMENT**

**Pat. Pend.





Attaches magnetically to ferrous surfaces bringing the capacity of heavy duty stationary presses right to the job.

Micro-Matic Adjustment permits transverse and radial movement of drill without moving magnetic base, thereby allowing precision placement with **only** one operator on vertical, overhead, and horizontal applications.

Illustrated literature of all MAG-TOOL PRODUCTS available on request.

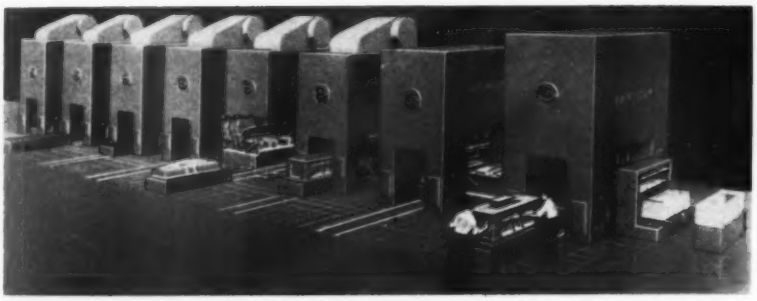
MAG TOOL

MAGNETIC TOOL CORP.

1955 LAFAYETTE STREET SANTA CLARA, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 113

NEW PRESS DESIGN CUTS DIE CHANGE TIME



Sliding bolsters and pre-set dies make the new Hamilton press especially suited for high production on short runs. It can be used as a single press, in groups, or for press lines, particularly highly automated production lines.

Although the press design has been used previously by the Hamilton Division of Baldwin-Lima-Hamilton Corporation for die spotting presses, the sliding bolster is new for Hamilton presses performing production operations such as blanking, drawing, and forming.

The sliding bolster design has these advantages: It

- Increases production through decreased press die change time.
- Reduces die setup time.
- Affords high production for short runs with a minimum of press downtime for changing dies.
- Reduces parts storage requirements.
- Eliminates the necessity of removing automation equipment, placed in front and back, when changing dies.

Production is increased because of the significant saving in die change time. As little as five minutes need elapse between the end of one production run and the start of another using a new die. When a press run is completed, the die is removed on the sliding bolster. A new die, set up on the second sliding bolster during operation with the previous die, slides into the press for a new production run. Normal time required to change dies on the outboard bolster is one half hour.

With this method, too, an overhead crane can be used exclusively, eliminating the time-consuming method of jockeying dies with both cranes and fork trucks on ordinary presses.

Each press has two bolsters independently actuated by pushbuttons which control the motor drive in the press base. Bolster movement can be independent or simultaneous. The bolsters travel through press sides rather than the fronts or backs, although they can go through the front or back of a single press when required.

During die loading, the bolster is completely clear of the press framework. Crane action is not obstructed by the press body or framework. After loading, the bolster partially slides back into the press framework to reduce the amount of floor or aisle space needed.

57-97

Proof of Precision: This 100,000th Spindle

. . . that's right. Ex-Cell-O has produced more than 100,000 precision grinding and boring spindles. They are in use today throughout the world, on a wide variety of important jobs. No other spindle manufacturer has so solid a record for satisfaction—so sound a reputation for building the best.

EX-CELL-O FOR PRECISION XLO

EX-CELL-O CORPORATION Machinery Division
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

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If you have not received your copy of METLFAX write to Dan Daniels, P.O. Box 3505, Cleveland, Ohio 18.

TOOL ENGINEERS:

Here's why it pays to specify

CHALLENGE

when you need precision surface equipment

1. CHALLENGE OFFERS THE MOST COMPLETE LINE . . .

of standard precision surface equipment. Over 300 different sizes and types of standard angle plates, box parallels, V blocks, layout plates, straight edges, semi-steel and granite surface plates and many other items designed to improve your tooling, inspection, production or assembly operation.

2. COMPLETELY CATALOGED . . .

to help you select the right equipment for each precision job. Most of the Challenge precision equipment is either carried in stock by your local Mill Supply Distributor or is otherwise readily available for prompt delivery.

3. PLUS ENGINEERING HELP . . .

in applying Challenge Surface Equipment to your special problems, particularly on installations of large surface or floor plates which must be specially engineered. Factory trained engineers and, in some areas, special technical representatives are available for help.

For complete information or a copy of the Challenge Precision Catalog (No. 838W) write today to:

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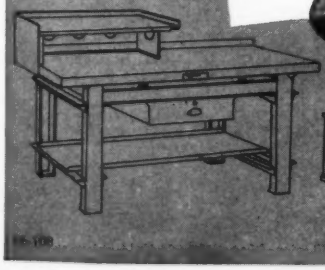

THE CHALLENGE MACHINERY COMPANY DEPT. TP-8
Grand Haven, Michigan

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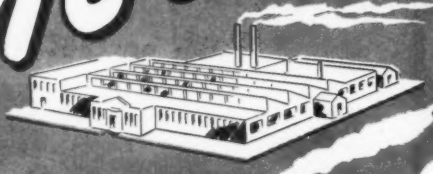
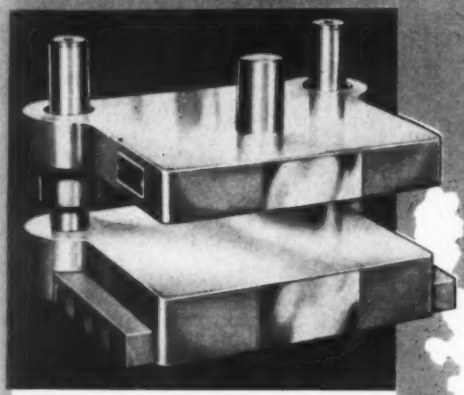
CIRCLE INFORM-A-GRAM KEY NO. 115

Announcing

SUPERIOR's NEW MANUFACTURING PLANT IN Connecticut



PLAINVILLE



now manufacturing for the Eastern Tool & Die Industry

A precision die set manufacturing plant within easy reach of ALL Eastern industrial centers for faster, more thorough, direct service. Superior's highly qualified technical skill available at a moment's notice to iron out costly production delays in your plant.

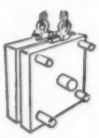
SUPERIOR die sets manufactured of quality materials . . . world-renowned for their long, accurate press runs. Speed-up handling from bench to press.

SUPERIOR offers complete engineering and manufacturing facilities at plants in Milwaukee and Plainville to produce *standard* or *special* die sets from the smallest to the largest. Over 33 years of manufacturing die sets to do your job BETTER, FASTER and at LESS COST.

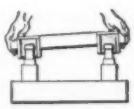
Exclusive SUPERIOR TIME and MONEY SAVING *Features*

SAFETY FLANGE
protects fingers by providing roomy gripping space on either side of the die shoe.

LOCK-JAW LIFTING DEVICE
removes the danger of handling large die sets.



E-Z LIFT SLING CHAIN
attach to the lock-jaw for immediate lifting.



"REMOVABLE CAP" PINS
End troublesome binding in parting dies.

WRITE FOR 24 PAGE CATALOG ON COMPLETE LINE OF SUPERIOR DIE SETS

SUPERIOR DIE SETS

for speedy Superior Service call these Representatives in your area!

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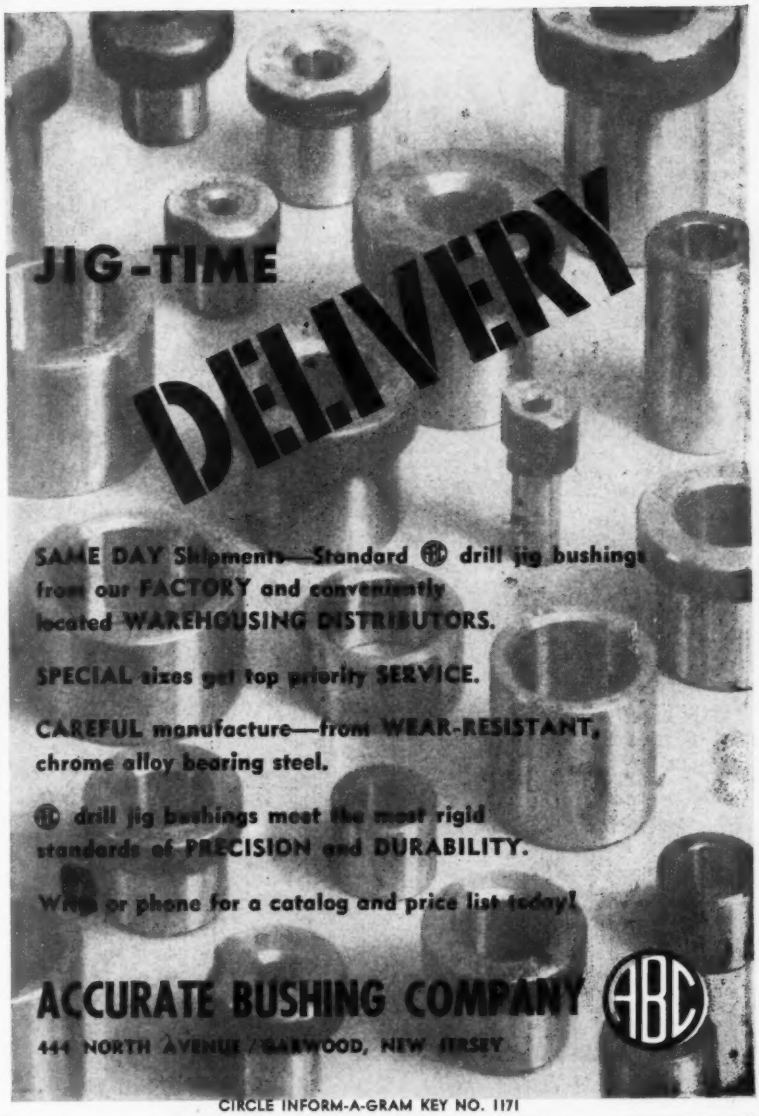
SUPERIOR STEEL PRODUCTS CORP. Eastern Division, Lewis Street, Plainville, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 116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DELIVERY
SAME DAY Shipments—Standard ABC drill jig bushings from our FACTORY and conveniently located WAREHOUSING DISTRIBUTORS.
SPECIAL sizes get top priority SERVICE.
CAREFUL manufacture—from WEAR-RESISTANT, chrome alloy bearing steel.
ABC drill jig bushings meet the most rigid standards of PRECISION and DURABILITY.
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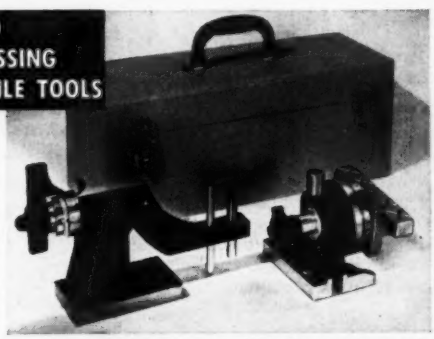
CIRCLE INFORM-A-GRAM KEY NO. 1171

Now ANGLE TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

MIGHTY GOOD AT ANY PRICE BUT TOPS AT ONLY $149.50
(Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.



Our fixtures will dress most radii and angles tangent to each other, similar to those shown below.

FREE handsome, wooden storage box. Write for complete information.

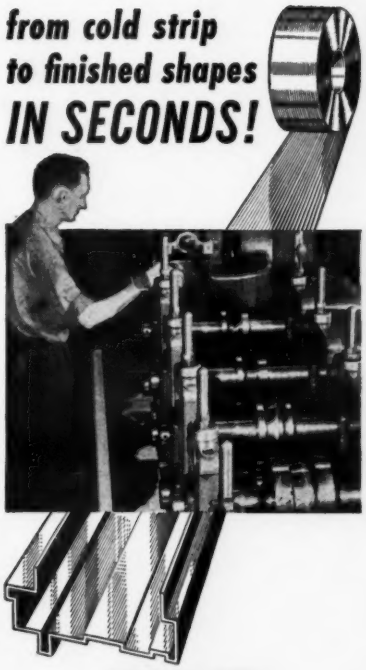
Distributorship available in select territories.

ROTHFUSS TOOL COMPANY

BOX 22, ELMWOOD STATION PROVIDENCE 7, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1172

from cold strip to finished shapes IN SECONDS!



YODER ROLL-FORMING MACHINES

If you are in the business of manufacturing a product that is, or could be, made wholly or partly from flat rolled metals in thicknesses up to ½", a Yoder Roll-Forming machine can help reduce your production costs.

Cold-formed shapes of every description —including structurals, tubular products, moldings, trim, roofing and siding, panels, cabinet shells, etc., can be produced on Yoder cold-roll forming equipment at the rate of 25,000 to 50,000 feet per day at a conversion cost of only a fraction of a penny per foot! With speeds and costs such as this, even part-time operation of a Yoder roll-forming line is a profitable investment!

Additional operations such as welding, coiling, ring forming, perforating, notching, embossing or cutting to length can be simultaneously introduced to the basic shape at little or no additional labor cost. Yoder engineers are at your service in explaining the advantages of roll-forming for your individual needs.

A new, revised, Fifth Edition of the Yoder Cold-Roll Forming book is just off the press. In addition to economic and mechanical possibilities of cold-roll forming, it contains numerous illustrations of end uses and applications of roll-formed shapes. Write for your copy today.

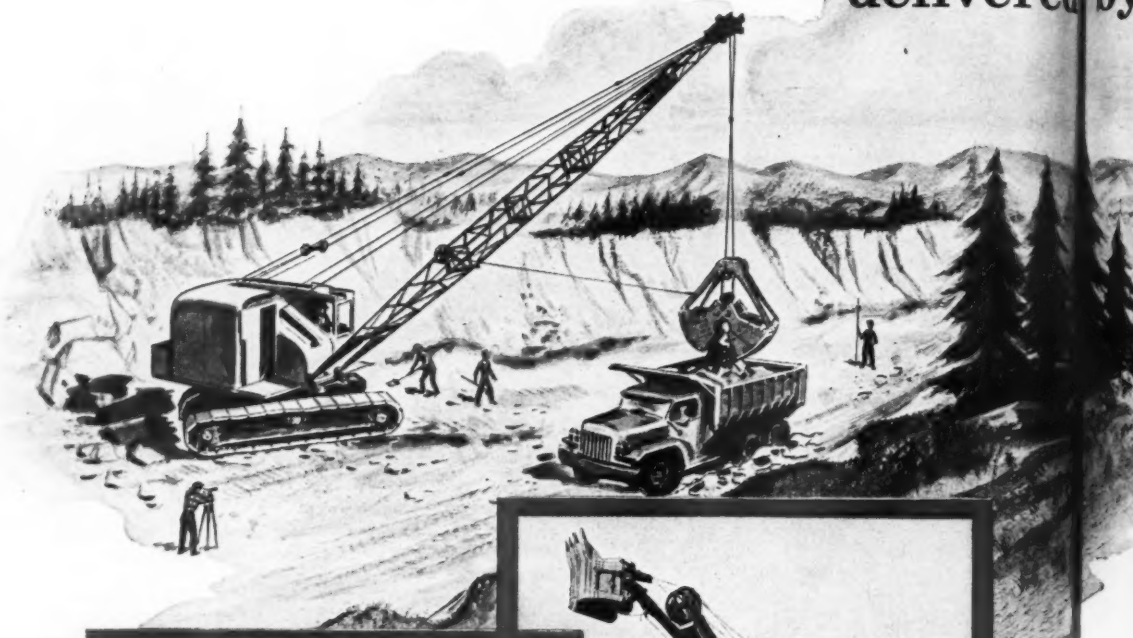
THE YODER COMPANY
5501 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING COLD ROLL FORMING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1173

POWER to build A

delivered by



Lorain-56 Shovel-Crane is 1¼ yard shovel, 25-ton crane, or 30-ton crane as desired, features torque converter to absorb working shocks and stresses, 2-lever air controls for easier operation.

Lorain Moto-Cranes* combine speed, power and versatility available in a range of lifting capacities from 7 to 75 tons. Multiple speed transmission, multiple big tires provide exceptional off-road mobility.

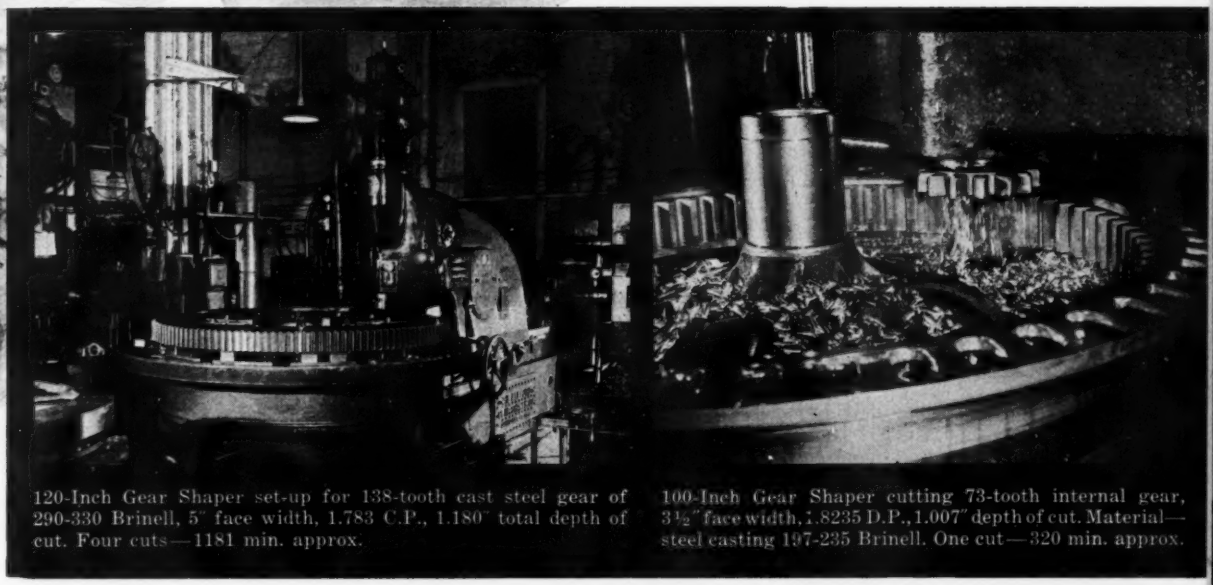
THE PRECISION LINE

Fellows G

*Reg. U.S. Pat. Off.

America's Highways...

by FELLOWS-CUT GEARS



120-Inch Gear Shaper set-up for 138-tooth cast steel gear of 290-330 Brinell, 5" face width, 1.783 C.P., 1.180" total depth of cut. Four cuts—1181 min. approx.

100-Inch Gear Shaper cutting 73-tooth internal gear, 3½" face width, 1.8235 D.P., 1.007" depth of cut. Material—steel casting 197-235 Brinell. One cut—320 min. approx.

The machines that move mountains of material for America's highway programs demand good, rugged, smooth running gears that will transmit, without failure, the many tons of force required.

The well known Thew Shovel Company of Lorain, Ohio is one of the major construction equipment makers that use Fellows machines to produce these gears. The largest Thew-Lorain gears require the largest capacity Gear Shapers in the Fellows Line, the 100-Inch and the 120-Inch.

These two Gear Shapers are designed to take heavy cuts at coarse feeds on spur or helical gears. Capacities: 28" to 100" for externals and 46" to 100" for internals on the 100-Inch; 28" to 120" for externals and 46" to 120" for internals on the 120-Inch. Maximum face width on each is 8".

For *full* information about the complete Precision Line of cost-cutting Fellows Gear Production Equipment get in touch with your Fellows representative. Write, wire or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices:
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6214 West Manchester Ave., Los Angeles 45

Gear Production Equipment

CIRCLE INFORM-A-GRAM KEY NO. 119

as easy as A B C

UNIPUNCH

PERFORATING UNITS

C Punching holes in the work with the first stroke of press ram. No aligning of punches and dies. The same group of units may be used in unlimited set-ups for greater economies.

WRITE FOR FULLY-ILLUSTRATED CATALOG *TODAY*

PUNCH PRODUCTS *Corporation* 3804 HIGHLAND AVE., NIAGARA FALLS, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 120

REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS RE

REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS

MODEL 618P
(large illustration)
with dust collector,
and (small illustration) with
wet grinding attachment.

A Complete Line of 618 and 824 Toolroom and Production Grinders

. . . and accessories

REID . . . the quality name in surface grinders! Choose from three different models in the 618 class; capacity 6″ wide, 18″ long, 17¼″ from spindle center to table. Accessories can be supplied for wet grinding, cool grinding, dust collecting, etc.

REID-O-MATIC 824 . . . this fully automatic surface grinder has a capacity of 8″ wide, 24″ long and 21″ from spindle center to table. All-electric controlled — solid construction — available with accessories above.

Get *all* the facts on REID grinders . . . your best buy for toolroom and production economy!

PRECISION REID SURFACE GRINDERS

REID-O-MATIC 824

Bulletins
Write for brochures on the REID 6-18 and REID-O-MATIC 8-24 for complete details

REID BROTHERS COMPANY, Inc.
136 Elliott Street, Beverly, Massachusetts

MANUFACTURERS OF PRECISION GRINDERS AND PRODUCTION LATHES

CIRCLE INFORM-A-GRAM KEY NO. 121

The COST of a drill bushing depends on

MEN YOU SHOULD KNOW

Four promotions have been disclosed by The Sheffield Corp. **O. A. Ahlers,** senior vice president, has been given the overall direction of the Machine Tool, Contract Manufacturing, and Threadwell-Conway Tap and Die Product Divisions. **W. Fay Aller** has been appointed vice president to supervise and coordinate the company's Autometrology, Standard Production Instruments, and Fixed Gage and Inspection Instruments Divisions. The new assistant vice president for coordinating the operations of the national field sales organizations is **J. T. Welch. William I. Wilt** has been advanced to assistant vice president of the Standard Production Instrument Division.

◆

Perry A. White has become vice president and general manager of the Eddystone Division of Baldwin-Lima-Hamilton Corp. The new vice president and general manager of the Electronics & Instrumentation Division is **Robert G. Tabors.**

◆

Alfred J. Sherman has been made vice president in charge of manufacturing for The Monarch Machine Tool Co. **Frank I. O'Leary** has become vice president in charge of industrial relations.

James S. Locke has moved into the newly created post of manager of operations for the commercial division activities of Minneapolis-Honeywell Regulator Co. He will be responsible for the manufacturing, engineering, and related administrative functions for the Minneapolis plants involved in the production of temperature control equipment.

◆

Jonathan Kludt is the new executive vice president and general manager of Lincoln Engineering Co. He joined the firm in 1934.

◆

Two appointments have been announced by The Cincinnati Milling Machine Co. **Hayward A. Gay** has been named manager of the Machine Tool Division and **Philip O. Geier, Jr.,** manager of the Products Division.

◆

Keith N. Stought has been promoted to plant manager, Industrial Crane & Hoist, Ingersoll Products Division, Borg-Warner Corp.

◆

The new chief engineer of the Industrial Department, Machinery Hydraulics Division, Vickers Inc. is **Robert A. Erskine. Carl E. Gunther** is heading the Marine and Ordnance Department as chief engineer.

Dana Corp. has announced that **A. L. Dyer, Jr.** will serve as superintendent of the new Aircraft Department, which will operate as part of the company's Pottstown Division.

◆

Edward J. Ferris, Jr. is serving as factory manager of the Machinery Division of Pratt & Whitney Co., Inc. He has been with the company since 1922.

◆

Leonard N. Goodell has been named manager of electrical products and **Fenton L. Tippett,** manager of mechanical products for the Sunnyvale Division of Westinghouse Electric Corp. The new manager of manufacturing of the electrical products department is **Kermit J. Clark. John J. McAuliffe** is serving as manager of manufacturing for the mechanical products department.

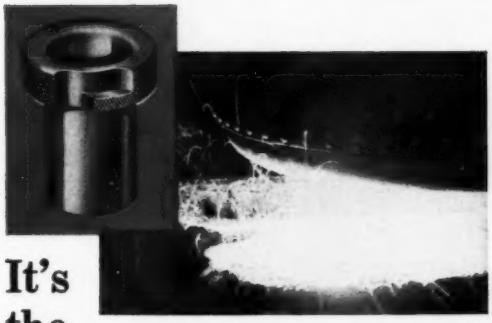
◆

Sterling Swanger has been named chief methods engineer for The Maytag Co., replacing **Cyril Vande Water,** who has resigned. Newly-appointed supervisor of methods engineers is **Kenneth Johnson.**

◆

Brown & Sharpe Mfg. Co. has disclosed that **George N. Levesque** has assumed new duties as director of research on a company-wide basis.

its working LIFE!



It's the *steel* in ACE drill bushings... *that makes the difference!*

When working life is doubled . . . bushing costs are cut in half! Fewer bushing changeovers add *bonus production savings!* That's why ACE drill bushings of new high-carbon chromium steel are being *specified exclusively* by cost-conscious tool men everywhere! Make a *working comparison* NOW with any other make bushing . . . and see "Positive Proof" that *the steel makes the difference!*

Write for the all new 1957 ACE Catalog and the name of your nearest distributor.

ACE DRILL BUSHINGS

ACE DRILL BUSHING CO., INC.
5407 FOUNTAIN AVE., LOS ANGELES, CALIF.

ACE DRILL BUSHING CO. EASTERN INC.
611 McCARTER HWY., NEWARK 5, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 123

MEN YOU SHOULD KNOW

The new general manager of Van Products Co. is **Vincent Q. Rapp.**

◆

Walter L. Robinson has been appointed quality control manager by Pheoll Mfg. Co. He has been in quality control and inspection work for 15 years.

◆

Clarence M. Leeds has been elected vice president for manufacturing for Simplex Equipment Corp., a subsidiary of General Precision Laboratory, Inc.

◆

Appointment of **H. Follett Hodgkins, Jr.** to the post of assistant general manager has been made known by Rollway Bearing Co., Inc. In his new capacity, he will assist in the overall supervision of the company's three Syracuse plants. Mr. Hodgkins joined the firm six years ago.

◆

Three new vice presidents have been elected at Woodruff and Edwards, Inc. **Orval Graening** has become vice president — Foundry Division; **Howard F. Lewis,** vice president — general sales manager; and **Carl O. Tolf, Jr.,** vice president — Wade Division.

◆

The election of **George M. Class** as a general officer to the board of directors has been made known by Gisholt Machine Co.

Paul L. Lantz is filling the position of production manager of the Abrasive Division of Norton Co. He succeeds **George A. Fyrberg,** who died recently. Mr. Lantz has been with Norton since 1935.

◆

Promotion of **Spencer J. Kohlmann** to chief engineer, automatic washers, for the St. Joseph (Mich.) Division of Whirlpool Corp. has been announced. **John H. Platts** has moved into the position of general manager of the company's Evansville (Ind.) Division.

◆

C. R. Rigby has joined the central manufacturing staff of A. O. Smith Corp.

◆

R. L. Williams has taken over as assistant chief engineer of the Automotive Division of The Timken Roller Bearing Co.

◆

Five appointments have been disclosed by The Gairing Tool Co. **John N. Miller** has been promoted to manager, processing development and methods. **Arthur L. Saull** has stepped into the position of factory manager. The newly created post of manager, plant engineering, is being filled by **Harry Tuscher. Frank J. Goddard** has become manager of the Estimating Department and **Carl Krueger,** manager of engineering.

Andrew L. Pontius has become vice president of Illinois Tool Works. In addition, he will continue as general manager of the Shakeproof Division.

◆

Appointment of **Dale V. Cropsey** as assistant to the president has been disclosed by Elgin National Watch Co. He will specialize in the development of the firm's industrial divisions. Mr. Cropsey will supervise both the electronics and the abrasives divisions, as well as the commercial development department.

◆

The post of chief engineer of Formsprag Co. is being filled by **Roger L. Daniels.**

◆

Eugene Caldwell has been elected president of Baker-Raulang Co.

◆

The appointment of **Robert N. Kendall** as vice president of Colonial Broach and Machine Co. has been announced.

◆

Robert F. Rea has been named director of engineering for Diamonite Products Mfg. Co., division of U. S. Ceramic Tile Co. In his new position, he will manage and coordinate the enlarged program of research and engineering of all Diamonite products.

Mr. Plant Engineer –

You're responsible for EFFICIENT air supply to pneumatic equipment

Here are
BRAND NEW
high-efficiency units . . . better air service . . . easier to maintain

Delivers really CLEAN dry air

Watts Filter delivers clean dry air to Federal Products Dimensionair.

High-Efficiency FILTER with exclusive "Tornado Action."

Extreme centrifugal force spirals dirt and moisture particles downward into the "quiet zone" leaving in the air only a minute percentage of the finest and lightest particles which are trapped by the filter cone.

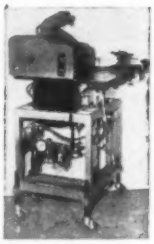
Maintains MORE UNIFORM PRESSURE

Watts Regulator maintains uniform air pressure for Scott-Williams KN Knitting Machine

High-Efficiency REGULATOR with highly sensitive "Aspirator Action."

Watts Aspirator control acts directly on the diaphragm, giving instant compensation for fluctuating pressure demands . . . provides precise control and stabilizes pressures reaching individual pieces of equipment.

LUBRICATES perfectly at all flow rates



Watts Lubricator provides efficient lubrication for Markem Machine Company's Model 70AF.

High-Efficiency LUBRICATOR with exclusive "By-pass pick-up."

Watts new By-Pass Pick-Up makes possible a sub-miniature, high velocity venturi section which positively creates sufficient force — even at flow rates as low as one cubic foot per minute — to vaporize oil into a fine mist for uniform, economical lubrication.

BEFORE YOU MAKE ANY COMMITMENTS —
get the facts on Watts new-design units which open up new worlds of efficiency in Pneumatic Operation, Line Maintenance, and Protection of Equipment against foreign matter.

REQUEST CATALOG AND DETAILED SPECIFICATION SHEETS

WATTS REGULATOR COMPANY
SINCE 1875

14 EMBANKMENT ROAD LAWRENCE, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 124

DRILLING MACHINE HAS EXTRA LARGE WORKING SURFACE

Eight or sixteen geared speeds is one feature of the Adams Upright Drilling Machine. It also has geared feeds from 0.002" to 0.021" per revolution of spindle.

Manufactured by the Adams Machine & Tool Co., Jackson, Mich., Model 427 has a 30½" by 34" table with coolant through and two 11/16" tee slots for ⅝" tee bolts. The machine has greater swing than most of this type.

In addition to the extra large working surface, the machine has 18" of vertical table traverse and 20" of combined spindle travel. This allows ample room under the spindle to use a multiple spindle drilling head on the machine, and still be able to retract the drills without disturbing the table or setup. The table permits drilling through the center of a 27" dia circle.

Distributed by Index Machine Co., the upright drilling machine has a capacity of 1¾" in cast iron and 1½" in mild steel. For details contact Index Machine Co., 541 N. Mechanic St., Jackson, Mich., or —
Circle Inform-A-Gram No. D1.

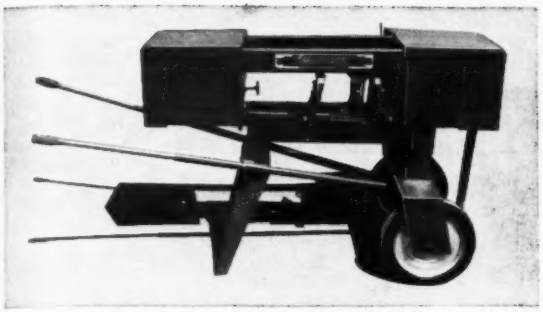
NECROLOGY

William J. Cox, 44, president of Quadriga Mfg. Co., Chicago, died of a heart attack June 15.

Samuel R. Swenson, 71, chairman of the board of the Midwestern Tool Company, Chicago, and a founder member of the Tool & Die Institute, died in June.

TAKE IT TO THE JOB...

KALAMOBILE —a metal-cutting band saw that's truly portable—handier than ever!



Here's the popular Kalamazoo Model 610 metal-cutting band saw on the handiest chassis you ever saw. Provides greatly increased portability with its rubber-tired 12-inch wheels and telescoping handles. One man shifts the 610 from job to job with ease. Capacity 6" Rounds—10" Flat.

610-D without coolant attachment.
610-W with coolant attachment.
Kalamobile chassis M6A fits all 610 models.

MACHINE TOOL DIVISION

Kalamazoo TANK and SILO CO.

857 Harrison Street, Kalamazoo, Michigan

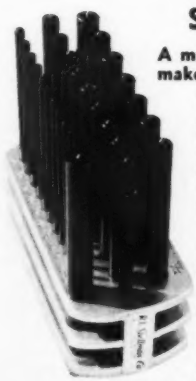
CIRCLE INFORM-A-GRAM KEY NO. 1251

Don't overlook these ways to cut production costs!

OK OK SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS • WORK-REST BLADES • CUT-OFF BLADES • SCRAP CHOPPERS • HARDENED SPACERS • BALL RACES • HARDENED WAYS • WEAR STRIPS • GIBS

THE OHIO KNIFE CO.
CINCINNATI 23, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1252



SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1253

HOLES JIG GROUND with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.

A five station indexing fixture from Vulcan's Contract Tool Room (Your tool room in Dayton).

Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result—eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

{ Borrow our instructive 11 minute movie on Jig Grinding. }

Services of your Tool Room in Dayton
Engineering . . Processing . . Building . . Special Machines . . Vulcanaire Jig Grinders . . Motorized Rotary Tables . . Brehm Shimmy and related dies.
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VULCAN TOOL COMPANY
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VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 1254

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Tap Selection Can Be Made Easily from the handy tap catalog. A table is included which gives tap sizes selection, complete information on class of fit, limit numbers, and gage data. Special taps are listed, ready

for immediate shipment, and tap-drill and thread-engagement selection tables for all common materials are shown. Direct requests for copies of Catalog 801 to Besly-Welles Corp., South Beloit, Ill., or —
Circle Inform-A-Gram No. B1.

A New Air-Operated Auto-Positioner is featured in a recently released bulletin. It will place workpieces from 1/16" to 3", approximate size, at speeds up to 6,000 per hr. Also described are several new standardized units that may be combined with existing equipment to automate small parts assembly operations. Write to Dixon Automatic Tool, Inc., 2300 - 23rd Ave., Rockford, Ill., or —
Circle Inform-A-Gram No. B2.

The Hanlo Universal Gage Unit is described and illustrated in detail in a catalog. Advantages and uses of all of the types of gage units as well as information on guards, extensions, and gage adjustment are given. Catalog 2-B may be requested from Hanlo Gage Co., Division of Johnson Die and Engineering Co., 16150 Hubbell Ave., Detroit 35, or —
Circle Inform-A-Gram No. B3.

More Than 1,000 Optical Items are listed in a new 72-page catalog. Illustrations and technical data on all types of optical instruments and components are included in the Optical Catalog. Copies may be obtained from Edmund Scientific Co., Barrington, N. J., or —
Circle Inform-A-Gram No. B4.

Precision Indexing without Backlash is one of the features of Colonial's positive-index table. In a 4-page bulletin the design, operation, and application of this new product are described and a line drawing explains the patented design. For copies of Bulletin JF-57 write to Colonial Broach and Machine Co., P. O. Box 37, Harper Station, Detroit 13, or —
Circle Inform-A-Gram No. B5.

A Ductility Testing Machine for Thin Gauges of Sheet Metal is highlighted in a bulletin published by Steel City Testing Machines, Inc., 8817 Lyndon Ave., Detroit 38. Model D provides a simple economical method of determining ductility before drawing. For complete information and specifications of the machine, write to the company for Bulletin D-856, or —
Circle Inform-A-Gram No. B6.

Best for every I.D.

High Production At Lowest Cost. Norton wheels for internal grinding are precision-processed to give completely uniform structure and identical top performance. There's no fussing with timing cycles when you change wheels.

Norton wheels spread the "Touch of Gold" across the internal grinding range

For high production grinding, 44 ALUNDUM*, 57 ALUNDUM, 19 ALUNDUM and regular ALUNDUM abrasives are all quality abrasives at non-premium prices. In particular, the new 44 ALUNDUM wheels have earned high praise from users in many different types of applications. For example:

A Michigan customer reports: *Breakdown was very even, with less glazing, excellent cutting action, and half the dressings needed by standard wheels. "44's" were the best ever used.*

From a New Jersey user the report is: *The "44's" are great for grinding sharp radii, with 30% more pieces per dressing and per wheel, and finish improved from 28 to 15 r.m.s.*

A Pennsylvania customer says "44's" are: *Freer cutting wheels that hold form better, require less dressing and greatly improve finish.*

Whichever of these abrasives you use, team it up with the Norton G Bond, the

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Reduce Weight and/or Increase Durability of Products using N-A-X high tensile steel. This low-alloy high-strength steel is the subject of a pamphlet prepared by Great Lakes Steel Corp., N-A-X Alloy Div'n, Ecorse, Detroit 29. General properties and characteristics of the products are discussed and illustrations accompany the material. Write to the company for your copy, or — **Circle Inform-A-Gram No. B7.**

Designed for Sidewall or Immersion Mounting are the circulating and coolant pumps described in an illustrated 4-page flyer. They have no stuffing boxes, no pump bearings, and no couplings, and their long shaft construction permits high liquid levels. Other features and specifications are also pointed out. For more information write to Ingersoll-Rand, 11 Broadway, New York 4, or — **Circle Inform-A-Gram No. B8.**

grinding job you do

Money-Saving Precision In Toolroom And Miscellaneous Internal Grinding is assured by the completeness of the Norton line — the right abrasive and bond for every type of job on every type of grinder.

W-1820

most efficient vitrified bond ever developed for accurate production grinding.

When your I.D. grinding is the toolroom type, choose 38 ALUNDUM or 32 ALUNDUM abrasive — the latter especially for the more-difficult-to-grind steels because of its outstanding ability to penetrate and hold the cut. And with these two famous abrasives, select G or BE bonds — both vitrified.

Your Norton distributor will gladly arrange a test of these "Touch of Gold" wheels in your plant. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels
Grinding Machines • Refractories
BEHR-MANNING DIVISION
Coated Abrasives
Sharpening Stones • Behr-cat Tapes

CIRCLE INFORM-A-GRAM KEY NO. 127

A New BarnesdriL Honing Tool Bulletin describes how the latest honing tool designs provide greater abrasive support for improved wear characteristics, and how these new designs are adapted to fit individual job requirements for greater honing efficiency. The four major honing tool classifications (slotted, flange, horizontal, and the new simplified BarnesdriL plate-type honing tool) are explained and illustrated. Copies of Bulletin 570 are issued by Barnes Drill Co., Rockford, Ill., or — **Circle Inform-A-Gram No. B9.**

Achieve Cost Savings In Production Departments where floor space is limited with a machine that utilizes in-line transfer with center column rotary index automation. This machine is described in the new folder prepared by Expert Die and Tool Co., 17144 Mt. Elliott Ave., Detroit 12. For your copy of Expert Automation, Vol. 1, No. 1, write the company, or— **Circle Inform-A-Gram No. B10.**

Albrecht Keyless Drill Chucks are discussed and illustrated in a 4-page bulletin. Pictures of typical applications of these products are shown, and detailed instructions for disassembly of drill chucks are accompanied by illustrations of the parts. Copies of Catalog 57 AC are available from The Jacobs Manufacturing Co., West Hartford 10, Conn., or — **Circle Inform-A-Gram No. B11.**

A Foam Cool Unit, operating on a jet principle and producing large volumes of light, cooling foam, is covered in a brochure. This unit which increases tool and coolant life and prevents splashing, can be used at a speed of 1000 sfpm, or more. For more information write to Production Specialists, 7234 W. Beecher St., West Allis 19, Wis., or — **Circle Inform-A-Gram No. B12.**

A Complete Line of Screw-Lock Inserts, including the miniature size 4-40 insert, is outlined in an 8-page specification bulletin. This literature contains Screw-Lock selection tables with thread sizes, insert numbers and sizes, and complete information on drilling, tapping, gaging, and installation. Copies of Bulletin 738 are prepared by Heli-Coil Corp., Danbury, Conn., or — **Circle Inform-A-Gram No. B13.**

1500° IN 5 MINUTES
2300° IN 30 MINUTES

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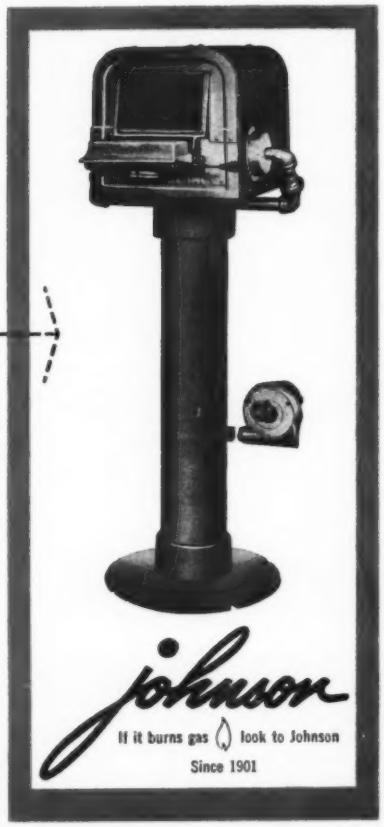
NUMBER 120 HI-SPEED FURNACE

That's the kind of quick heating action you get with this compact, powerful furnace. It's economical to operate, too. Fast heat-up saves time and gas. High-temperature insulated firebox, 5" by 7¾" by 13½", gives even hardening of high speed and carbon steel dies, tools and small parts. Temperature easily regulated. G.E. motor and Johnson Blower included. 120,000 BTUs per hour.

Pedestal style, F.O.B. Factory....$167.00
No. 120 also available in bench style.



Write today for free Johnson Catalog

Johnson Gas Appliance Company

575 E Avenue NW, Cedar Rapids, Iowa

CIRCLE INFORM-A-GRAM KEY NO. 1281

do your Ductility Testing *quick & easy*

The turning of a single hydraulic control knob clamps the specimen, tests it, then releases it The test is made in plain view, and the maximum pressure indicators show the result until reset. This highly sensitive sheet metal tester will take up to 3/16" thick specimens and exert up to 30,000 pounds pressure, at any desired rate of speed. Hydraulic mechanism is all neatly enclosed. Write for catalog sheet and prices.

DETROIT TESTING MACHINE COMPANY

9386 *Grinnell Ave., Detroit 13, Mich.*

CIRCLE INFORM-A-GRAM KEY NO. 1282

CONTRACT TOOLING AND PRODUCTION

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DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings,

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DAVIS TOOL and ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery, Sheet Metal Stampings and Assemblies.

UNIVERSAL GEAR & MACHINE CO.
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Gears, Sprockets, Worms, up to 168". Free Catalog of 8,000 Stock Items. Free 36-page Catalog on our manufactured machinery of complete slitting, uncoiling, recoiling and cut to length lines.

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CLEVELAND UNIVERSAL JIG COMPANY
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DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
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Complete Plant Routing and Tooling

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Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

Pennsylvania

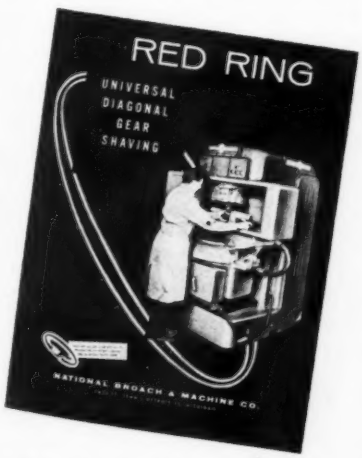
MEDAL MANUFACTURING CO.
328 Vine St., Sharon, Pa. Machined parts, complete machine assemblies, special machinery. Send us your prints for quotes.

Improvements in Design and Additional Mounts for "compact" hydraulic cylinders are shown in Bulletin 57-68 recently issued by Vickers Inc., Detroit 32. The bulletin provides detailed information on the construction and features of 2000 psi cylinders, including new trunnion-mounted cylinders. Also included are complete tables of sizes and dimensions, and engineering data on application, mounting, piston areas and speeds, cylinder cushion lengths, and circuits.
Circle Inform-A-Gram No. B14.

A New, Two-Color, Illustrated Bulletin published by Sandvik Steel, Inc., Fair Lawn, N. J., describes Sandvik's service facilities, and catalogs some of their spring and specialty strip steels. Each type of strip steel is listed by application and the material, finish, usual size range, and the chemical analysis is given for each. The bulletin may be obtained by writing the company, or —
Circle Inform-A-Gram No. B15.

Application Ideas and Features of Rapistan Flow Track are presented in a new bulletin. This versatile conveyor strip, which is gravity conveyor in its basic form, can be combined with other conveyors or be used in various combinations of itself for a multitude of purposes. For your copy of Bulletin FT-57, write to The Rapids-Standard Co., Inc., 342 Rapistan Bldg., Grand Rapids, Mich., or—**Circle Inform-A-Gram No. B16.**

The Red Ring Universal Diagonal Gear Shaving Process is explained in an 8-page catalog. The basic design features of the Model GCU Red Ring diagonal shaving machine, which is built in three types, are described



and illustrated in the catalog. Copies of Bulletin S-57-2 are published by National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, or —
Circle Inform-A-Gram No. B17.

Facilities for Prototype and Production Work on instrument components and assemblies are explained in a 4-page bulletin. The illustrated publication includes a detailed listing of all production machinery and equipment available. Typical procedures in the design, tooling, and assembly of instrument and business-machine components are pictured, along with a number of production operations. For your copy write to Arrow Tool Co., Inc., 36 Mill St., P. O. Box 41, Wethersfield 9, Conn., or—**Circle Inform-A-Gram No. B18.**

Information on Four Nickel-Base Alloys are presented in a recent edition of "Hastelloy Corrosion-Resistant Alloys." The 104-page booklet describes chemical compositions, physical, mechanical, and high-temperature properties of the alloys. Also included is a table of the comparative resistance of the alloys and laboratory penetration data on some corrosives. Copies are available from Advertising Department, Haynes Stellite Co., Div'n of Union Carbide Corp., 420 Lexington Ave., New York 17, or — **Circle No. B19.**

FOR THE TOOL ENGINEER
WHO NEEDS EVERYTHING
Plus FAST SERVICE!

3P PUNCHES & DIE BUTTONS
BAL-LOK* PUNCHES & DIE BUTTONS

Special Punches & Die Buttons**

No delay when ordering. Fast delivery service from more than 75,000 basic sizes in stock through Distributors in principal cities. 3P specializes in promptness, service.

3P Head Punches and Die Buttons, and Bal-Lok* Punches and Die Buttons are made of the finest quality tool steels. Both types are available in any DECIMAL size. No extra charge for high quality or ODD sizes. Bal-Lok* Punches are guaranteed interchangable in your present retainers.

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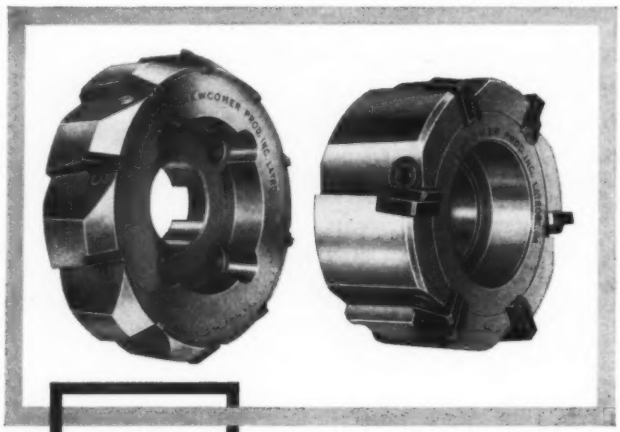
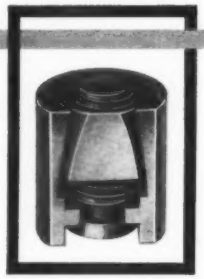
CIRCLE INFORM-A-GRAM KEY NO. 129

Setting a new pace in high speed milling

Newcomer RC Milling Cutters and NP "Throway" Carbide Blades





New "C"-LOCK facilitates indexing . . .

In one operation after another, Newcomer RC Milling Cutters are setting a new standard for high speed milling . . . a standard that has enthusiastic users reporting increased production at a new low cost!

These new two-piece cutter bodies with distinctive features combine with NP "Throway" carbide blades to permit heavier feeds and faster speeds . . . eliminate grinding time and costs . . . drastically cut machine downtime . . . and minimize cutter inventories. One cutter body can mill both steel and cast iron by simple use of proper NP carbide grade.

"C"-Lock rigidly holds blade against flat ground seating surface of cutter body. This lock provides quick access to change and indexing of cutter blades with nothing more than a hex wrench. Blade won't move or "work out" during tightening. Indexing is positive . . . accurate!

Contact your local Newcomer representative . . .

Newcomer RC Milling Cutters are available in triangle blade styles for heavy and general purpose milling; or in square blade styles for general purpose and shoulder type milling.

NEWCOMER PRODUCTS, INC.

LATROBE, PA.

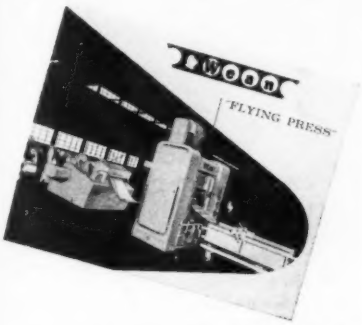
Telephone: KEystone 7-5531

GENERAL SALES OFFICE: 512 Franklin Ave., Pittsburgh 21, Pa. Telephone: CHurchill 1-4060

SALES OFFICES LOCATED IN PRINCIPAL CITIES

CIRCLE INFORM-A-GRAM KEY.NO. 130

Six Basic Press Operations are performed by the "Flying Press." A booklet explains the broad principles involved in the design of this machine, outlines some of the advantages from the standpoint of productivity, maintenance, die life, and quality control; and lists the available sizes. Copies of the illustrated booklet are issued by Wean Equipment Corp., 22800 Lakeland Blvd., Cleveland 17, or —
Circle Inform-A-Gram No. B20.



Three Grades of Hot Work Die Steel are described in a 4-page bulletin. Included in the technical bulletin are two graphs and an analysis of the three grades covering elevated temperature physical properties meeting aircraft specifications for structural parts. Bulletin 13-2 may be obtained by writing Firth Sterling, 3113 Forbes St., Pittsburgh 30, Pa., or —
Circle Inform-A-Gram No. B21.

Profiling Tools Incorporating Kendex "Throw-away" Inserts are cataloged in a bulletin from Kennametal Inc., Latrobe, Pa. Four styles of these carbide tools with a total of 18 standard variations in dimensions are offered with Kennametal insert seats and chip breaker plates. For further information write to the company for Bulletin B-105, or —
Circle Inform-A-Gram No. B22.

A Cutoff Saw That Sets Up in 1½ min, including changeover from ferrous to non-ferrous materials, is outlined and illustrated in a new bulletin. In addition, other special features and advantages are pointed out. Copies of this bulletin of Model CS7 are published by Kenco Manufacturing Co., 5211 Telegraph Rd., Los Angeles 22, Calif., or —
Circle Inform-A-Gram No. B23.

New Aluminum Hand Knobs have been added to the product line of Northwestern Tool & Engineering Co., 116 Hollier Ave., Dayton 3, Ohio. A flyer sheet pictures and describes the hand knobs, and also shows a condensed tracing template of all sizes in full scale. Request copies of the flyer from the company, or —
Circle Inform-A-Gram No. B24.

The Adamas Line of Throwaway Inserts for Dex-A-Tool represents a wide range of stocked carbide grades and blank sizes in the square, triangle, and round inserts for use in standard mechanical toolholders. These products are described in a 32-page catalog which also presents the complete line of tungsten carbide tools, tool tips, dies, wear parts, and Ceralox. Copies of Catalog 357 are available from Adamas Carbide Corp., Kenilworth, N. J., or —
Circle Inform-A-Gram No. B25.

In the New Vertical Turret Lathe Catalog the exclusive electric clutch controlled coaxial planetary transmission is explained. It speeds up machining by permitting shifting feed on the fly and changing speeds in the cut. The catalog also presents all features of the company's line of 32", 42", and 52" vertical turret lathes. For your copy of Catalog VTL-3, write Kaukauna Machine & Foundry Div'n of Giddings & Lewis Machine Tool Co., Kaukauna, Wis., or—**Circle Inform-A-Gram No. B26.**

NOW!
GREATER
PRECISION...
PRODUCTION...
ECONOMY...
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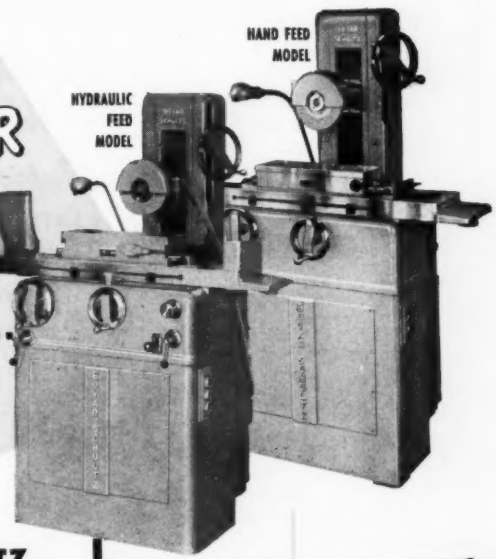

BOYAR-SCHULTZ
6 x 18
SURFACE GRINDERS

Available in Hydraulic and Hand Feed models.

These machine tools are of the most advance design, fully proved and enthusiastically endorsed by users who must have accuracy as well as production performance.

Exclusive features include heavy duty precision spindle; vertical column assembly supported by horizontal cylindrical ways; closely grained nickel alloy table with longitudinal ways of hardened and ground tool steel; vertical feed assembly with precision ground worm gear perfectly fitted to bronze gear for easy operation.

Hydraulic operation is accomplished by controls A and B above. These controls automatically disengage longitudinal and cross feed hand wheels.

Table ways, one V and one flat are ground and hand scraped. They travel on hardened and ground tool steel ways.

Precision screw on vertical feed assembly turns through a perfectly fitted steel worm and bronze gear, operating in grease packed, sealed gear box.

Unique column assembly combines vertical and cross feed travel. Sturdy vertical column has oversize bearing surfaces. Hardened and ground cylindrical ways provide accurate long wearing surface for cross feed travel.

Write, wire or call. We'll be glad to SHOW you what this fine grinder will do.

BOYAR-SCHULTZ
CORPORATION

2012 South 25th Avenue
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CIRCLE INFORM-A-GRAM KEY NO. 131

Gun Drilling of Difficult Materials and Unsymmetrical Workpieces such as manifolds and valve bodies, or symmetrical pieces such as injection cylinders and aircraft pins, are discussed and illustrated in a 4-page catalog. Explained are the economies made possible by eliminating secondary operations of boring and reaming through stacking parts and drilling, etc. For copies write to Deep Hole Specialists, Inc., 56 River St., Chagrin Falls, Ohio, or —
Circle Inform-A-Gram No. B27.

Information about Low-Cost Power and Free Overhead Conveyor Systems is presented in a new planning folder. Included is a planning grid plus an explanatory diagram of one of Chainveyor's systems, which handle any type of intermediate loads through stage processing, intermittent storage, or intricate "stop and go" operations. The planning folder can be requested from Chainveyor Corp., 5618 E. Washington Blvd., Los Angeles 22, Calif., or —
Circle Inform-A-Gram No. B28.

WICKMAN-BROWN *Fully Floating*
MICROMETER ADJUSTABLE REAMERS

Typical Applications:
- LATHES
- TURRET LATHES
- MULTI SPINDLE AUTOMATICS
- CHUCKING MACHINES
- SINGLE SPINDLE AUTOMATICS
- VERTICAL AND HORIZONTAL BORING MILLS
- JIG BORERS
- GENERAL TOOL & DIE ROOM AND SHOP MAINTENANCE

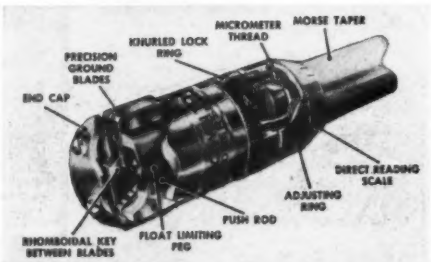
Type S for through hole reaming.
Type SL for blind hole reaming.
Range in Sizes: ¾" to 8" in only 18 units

Type SO for through hole reaming only—range from ½" to ¾" in ONLY 5 Sizes.

The initial cost of a Wickman-Brown reamer is your last major expenditure. The blades, available in both high speed steel and tungsten carbide, are precision ground and may be sharpened repeatedly without affecting micrometer reading.

Eliminates costly floating tool holders by built-in positive and predetermined float.

Down time is eliminated on production due to micrometer adjustability without removal of blades or unit from machine.



Distributors' Inquiries Invited

THE Wickman MANUFACTURING CO.
10329 CAPITAL AVENUE (OAK PARK) DETROIT 37, MICHIGAN

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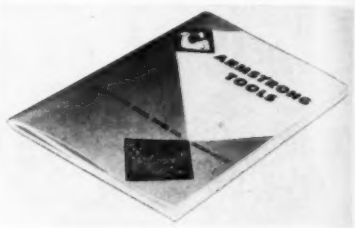
4,980 Tools for Industry and 500 New Types and Sizes are listed in a new 120-page catalog. Included in this comprehensive publication are complete lines of wrenches, socket



wrenches, and drop forged clamps, tool holders, set up and hold down tools, cutting tools, and pipe tools. Obtain your copy of Catalog 57 from Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago 30, or —
Circle Inform-A-Gram No. B29.

Fill Blowholes in Both Machined and Raw Castings, and eliminate sand pits, small gas holes, shrinkage, cracks, deep nicks, and scratches with "Flawmaster" metal putty. In addition, it is used in machining flaws and porous areas in precision metal parts. Easy to handle, metal putty cures without shrinkage at room temperature in a few hours. For copies of the "Flawmaster" Bulletin 183, write to Carl H. Biggs Co., 2255 Barry Ave., W. Los Angeles 64, Calif., or —
Circle Inform-A-Gram No. B30.

Eight Different Models of Gear Driven Welding Positioners, ranging from 500 to 24,000-lb capacity are pictured in a new bulletin. Included are complete descriptions, specifications, and optional extras in Bulletin HD57. Write to Aronson Machine Co., Arcade, N. Y. for your copy of the bulletin, or —
Circle Inform-A-Gram No. B31.

Various Types of Processing Machinery are reviewed in the latest edition of "Metalwash." With the finger index, sections such as heat treating, vapor degreasing, phosphatizing, and spray washing are easy to find. Copies of Catalog G-54 are made available by Metalwash Machinery Corp., 901 North Ave., Elizabeth 4, N. J., or —
Circle Inform-A-Gram No. B32.

Lufkin Magnetic Base Tools are discussed in a 12-page catalog. Illustrated with pictures, diagrams, and charts the catalog gives comprehensive information about each tool. Descriptions and specifications also accompany each item. Catalogs are available by writing to The Lufkin Rule Co., Saginaw, Mich., or —
Circle Inform-A-Gram No. B33.

GET AHEAD in Your SPRAY DECORATING with Conforming Matrix

Mechanical and Air Operated Clamps and Pressure Fixtures for Holding Masks and Parts

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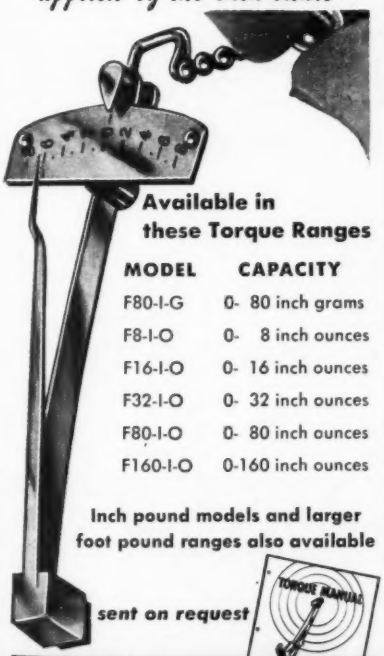

Available in these Torque Ranges

MODEL	CAPACITY
F80-I-G	0- 80 inch grams
F8-I-O	0- 8 inch ounces
F16-I-O	0- 16 inch ounces
F32-I-O	0- 32 inch ounces
F80-I-O	0- 80 inch ounces
F160-I-O	0-160 inch ounces

Inch pound models and larger foot pound ranges also available

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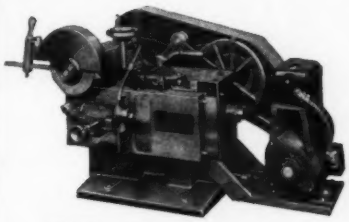

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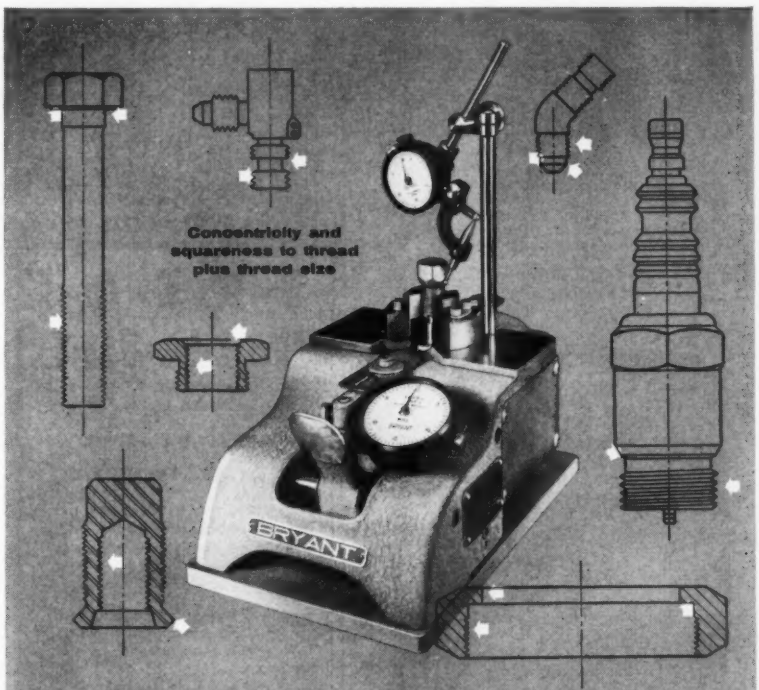

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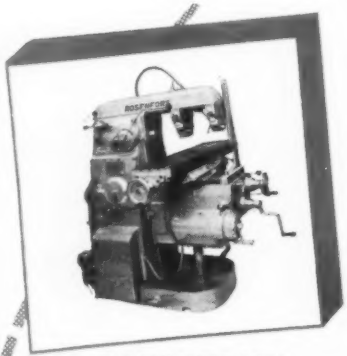

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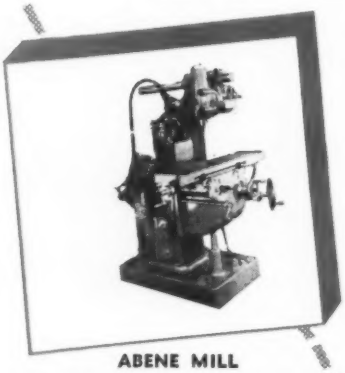

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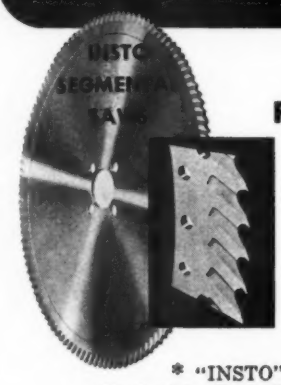
CRAFTED IN SHEFFIELD* FOR MORE CUTS PER DOLLAR



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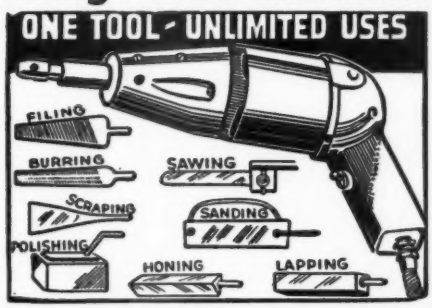
This handy tool will cut out many tedious hand filing and finishing operations — Increase Production — Produce Uniform Work.

Light in weight — Delivers 1/8" or 3/16" fixed stroke at 1000 strokes per minute — Operates on 110 volts AC or DC.



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STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
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With DYKEM Steel Blue
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CIRCLE INFORM-A-GRAM KEY NO. 1344

Reamers Are Listed by Decimal Equivalents from 0.0400" to 3.0000" in the Comparative Net Price Selector Catalog. Complete size and type information is placed side by side showing specific types available in

standard sizes. Each reamer is illustrated, described by type, shank, flute, length, and list number. Contact Lavallee & Ide, Inc., Chicopee, Mass., for further information, or —
Circle Inform-A-Gram No. B34.

M-F Spin-Lock Nuts are described in a 4-page brochure. Detailed information on sizes, dimensions, and specifications are presented. The ratchet-like structure of the Spin-Lock nut, which provides the locking feature, is explained. Other advantages include the one-piece construction for faster assembly, lower inventory, and high safety. The brochure is supplied by MacLean-Fogg Lock Nut Co., 5535 N. Wolcott Ave., Chicago 40, or —
Circle Inform-A-Gram No. B35.

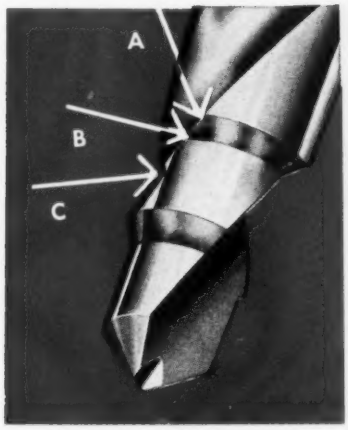
A Line of PT (Pull Thru) and 9SP (Self-Plugging) Blind Rivets are outlined in an illustrated catalog. The catalog lists the advantages of the two types of blind rivets and illustrates a number of typical applications with cross-section drawings. Among the technical data provided are material specifications, recommended hole sizes, and shop practice notes. Complete dimensions, grip ranges, and tolerances for both blind rivet types are also included. Copies of the bulletin are available from Huck Manufacturing Co., 2480 Bellevue Ave., Detroit 7, or —
Circle Inform-A-Gram No. B36.

Carbide Tools and Dies are presented in a catalog offered by Jaquith Carbide Div'n, 19 Stewart St., Lynn, Mass. The catalog describes uses, advantages, and specifications of these products. Illustrations show the tools in use. For your copy of the catalog, write to the company, or —
Circle Inform-A-Gram No. B37.

A 75 to 200 Ton Capacity Stamping Press features the rack — the single moving member of the feed mechanism. Alpha two point, back gear underdrive, high-speed automatic production stamping presses are outlined in a 12-page catalog. Detailed diagrams of functional parts are also shown. Copies of Catalog 57-2 are made available by Alpha Press & Machine, Inc., 9281 Freeland Ave., Detroit 28, or —
Circle Inform-A-Gram No. B38.

A Torque Testing Fixture is explained and typical applications of this product are illustrated in a 4-page brochure. Other features which are pictured are the long columns, azimuth dials, power drive assemblies driving rings, air operated rams, slide holders, etc., and the adaptability of the Torque Testing Fixture. For further information, write to P. A. Sturtevant Co., Addison, Ill., or —
Circle Inform-A-Gram No. B39.

Almost any tool you use is a better tool if you grind it with R-O



Ground form relief of cutting edges (A), is as easy to obtain today as ordinary angular back off. With the R-O fixture you get other obvious advantages such as no undercutting at intersections (B), any amount of circular margin on non-cutting edges (C), etc. It all adds up to this — you get better cutting and up to double the cuts per grind. Write for the R-O catalog.

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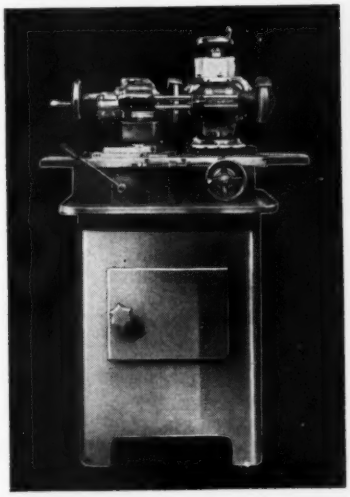
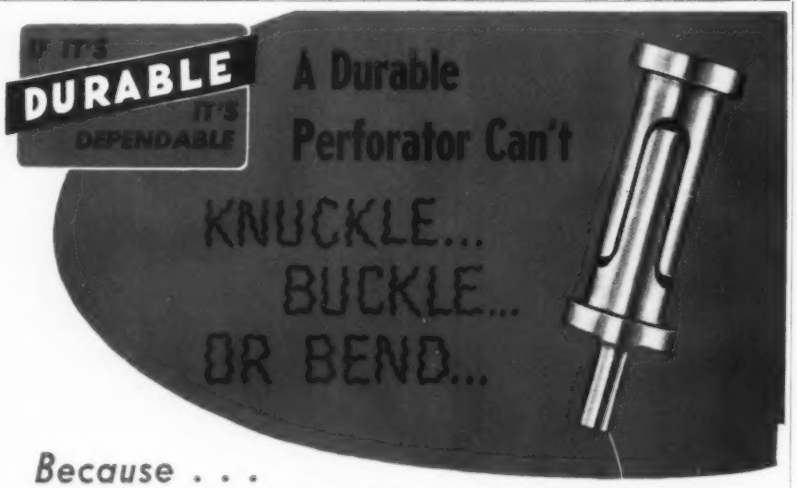
FIXTURE
R-O Grinder
ROYAL OAK TOOL & MACHINE CO.



CIRCLE INFORM-A-GRAM KEY NO. 135

Complete Details on The New Lightweight Trojan "A" Series Portable Belt Conveyor have been released in bulletin form. This series is for heavy-duty loading, unloading, stacking, and boosting at angles up to 30°. The incline is hydraulically adjustable to desired angles by finger-touch operation. Copies of Bulletin 50AA are supplied by E. W. Buschman Co., Clifton and Spring Grove Avenues, Cincinnati 32, Ohio. or—**Circle Inform-A-Gram No. B40.**

Two New Versions of the Automatic Screw Machine are described in Bulletins SM 28 and SM 29. One version is designed with a one-position slide and the other with turret. Both will handle work that does not require spindle reversal. One is for fast forming and cutting-off operations and the other for all automatic operations except threading. Copies can be obtained from Brown & Sharpe Mfg. Co., Providence, R. I., or—**Circle Inform-A-Gram No. B41.**



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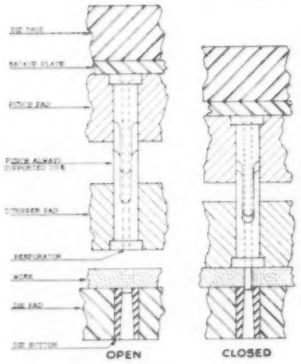

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You get positive alignment, closer tolerances, burr free holes, regardless of the types of metal used. Holes are punched faster, easier and accurately.

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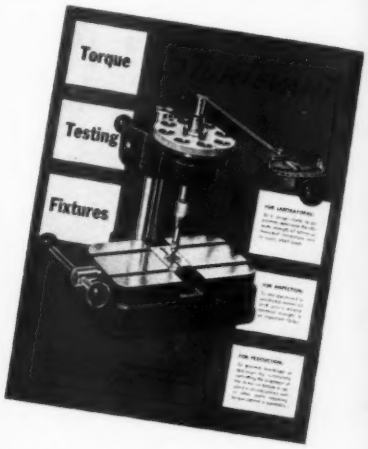
Aluminum-Filled Epoxy Resin Compounds are the subject of a 4-page illustrated bulletin. The A2 series of these products are designed for use in the aircraft, marine, and

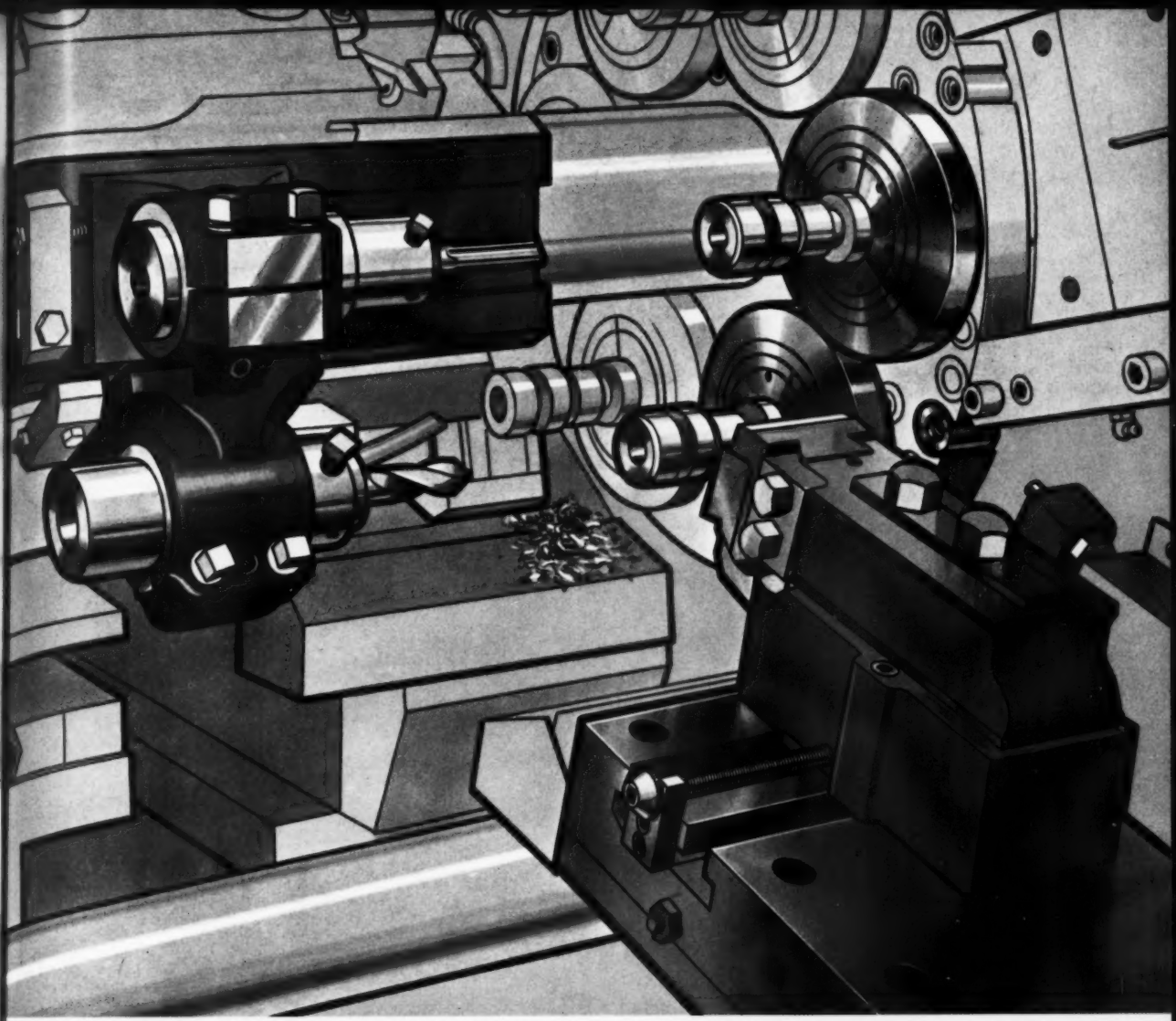


metal-working industries. The bulletin outlines many uses of Metalset and describes its advantages. Write to Smooth-On Manufacturing Co., 572 Communipaw Ave., Jersey City 4, N. J., for copies of Metalset A2 series, Bulletin 11, or —
Circle Inform-A-Gram No. B42.

Designed for the Precision Threading of Small Diameter Workpieces is the 5C Landmaco threading machine. The machine has a range of 4" to ⅝" and will produce threads to Class 3 and 4 tolerances on a production basis. Features such as air operated carriage fronts, air operated carriage returns, manual and automatic workstops, collets, and chucks are described. Illustrated Bulletin H-74 is published by Landis Machine Co., Waynesboro, Pa., or —
Circle Inform-A-Gram No. B43.

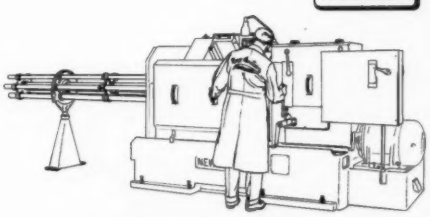
"Jig and Fixture Detail Catalog" contains full scale templates of all products. Its loose-leaf form simplifies removal for detailing and tracing. Fixture clamps, fixture keys, cams, screws, nuts, washers, handles, hand knobs, and hand wheels and included in the 82-page catalog. Copies of the catalog are supplied by Harco Engineering, 12092 Woodbine Ave., Detroit 39, or —
Circle Inform-A-Gram No. B44.

Select Standard Carbide Tools, Tips, Blanks, and Inserts from a 30-page catalog. Diagrams and charts of many of the items are presented. Also included in this catalog is a section of performance data on carbides. For your copy of Catalog A-101 write to Unimet Carbides, Div'n of United Drill and Tool Corp., 435 W. Ontario St., Chicago 10, or —
Circle Inform-A-Gram No. B45.

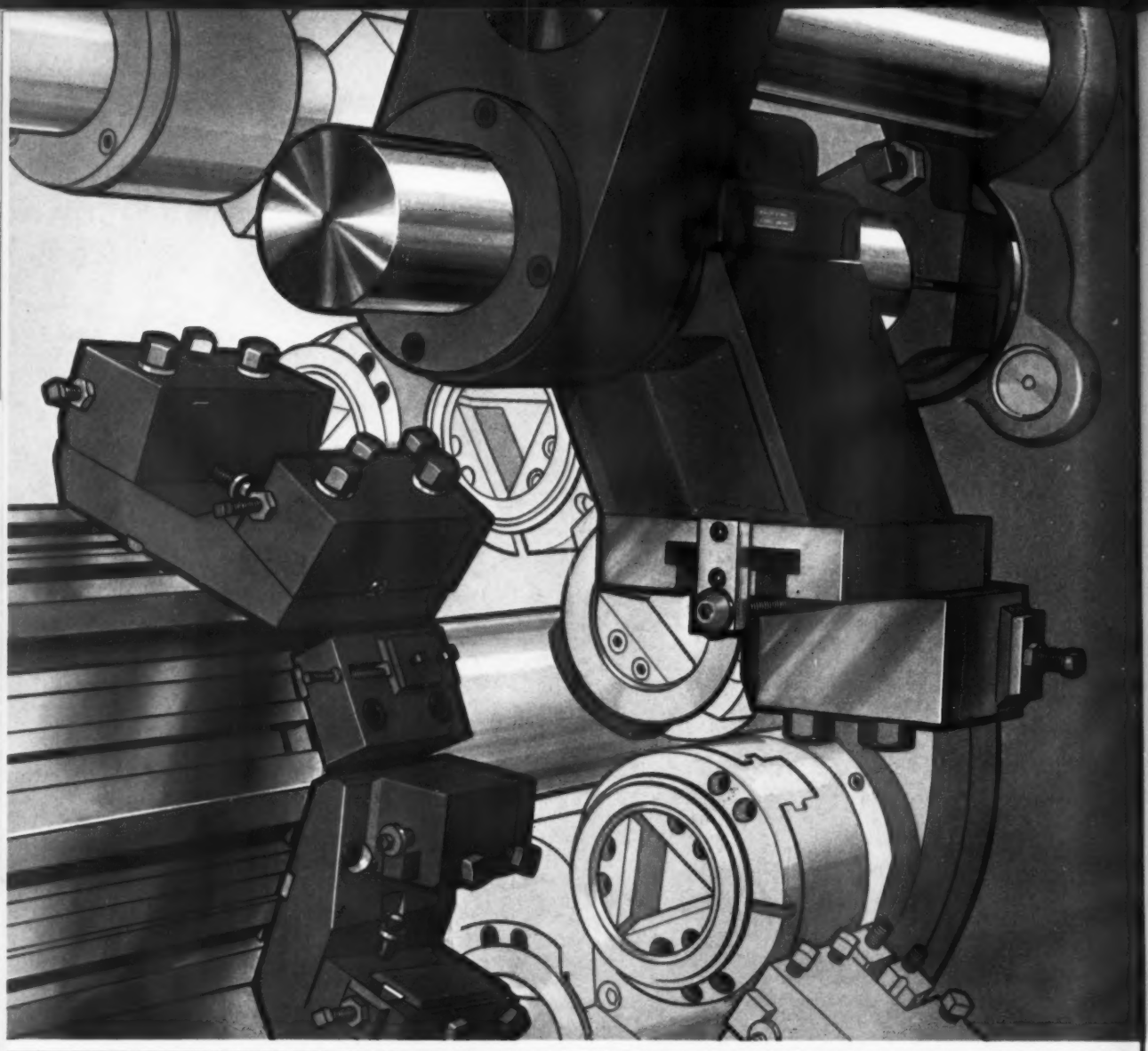


less wear means more profit

New Britain bar machines are "built to stay accurate." Hardened spindle nose cross slides, eccentric cross slide stop buttons and tool slides, plus carrier lifting during index, are only a few of many *exclusive* New Britain features for preserving long-run accuracy. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



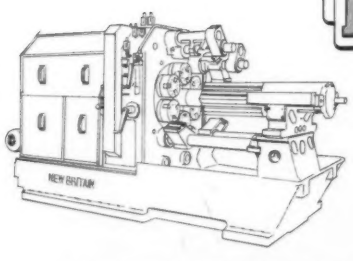
Automatic Bar Machine



when the job calls for a big, husky chucker

pick a New Britain

New Britains are massive, not only in over-all size and weight, but in every individual feature. Rugged forming arms and tool slides transmit smooth power to the cutting edge in every position. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



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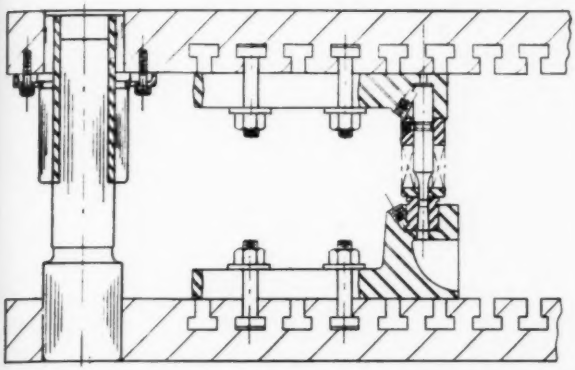
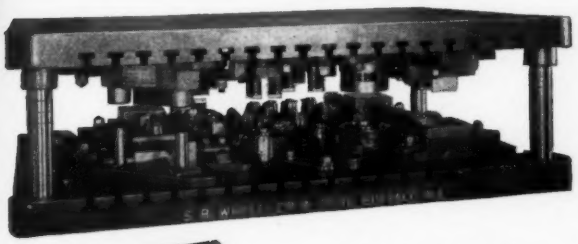
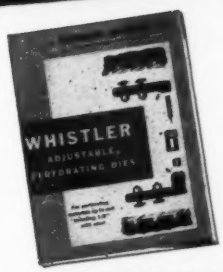
• Operate like a single purpose die • Easy to set-up and make changes • Interchangeable and re-usable parts always ready for a new job • Reduce die costs to a new low • Pierce holes in any desired arrangement of shapes and sizes • Precision piercing of materials to ¼" thick steel.



Above: Sectional drawing of a Whistler adjustable punch and die unit assembled in T-slot die set. **Below:** A completely assembled Whistler adjustable die ready for the press.





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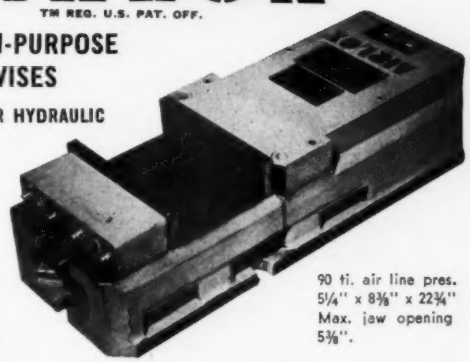

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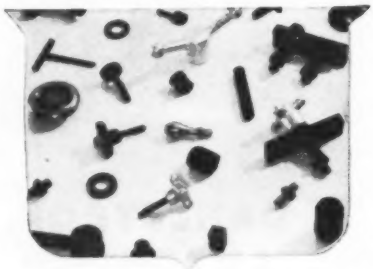

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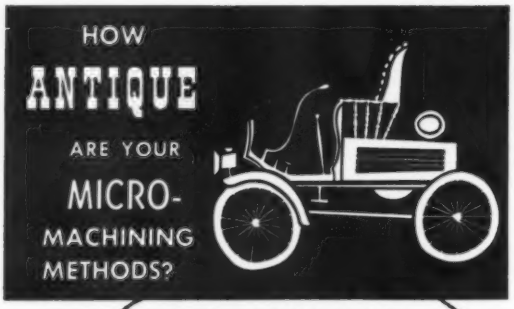

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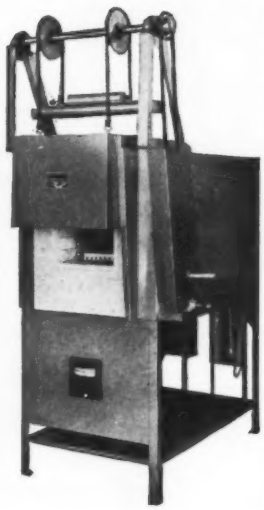

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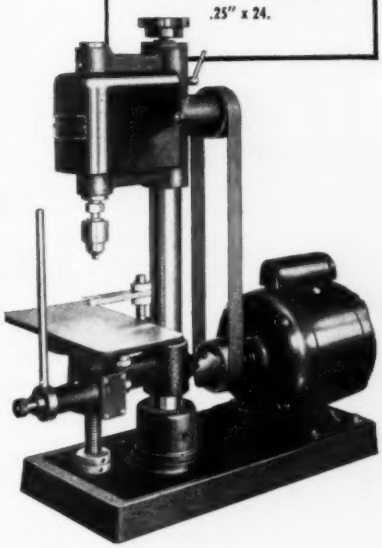

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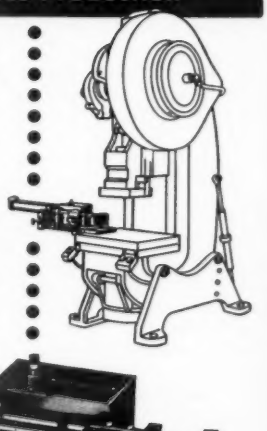

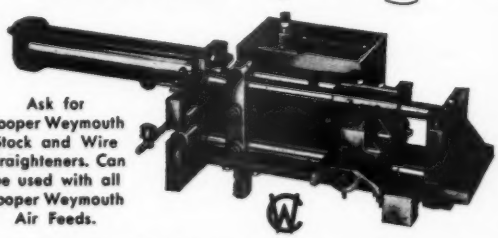

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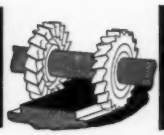

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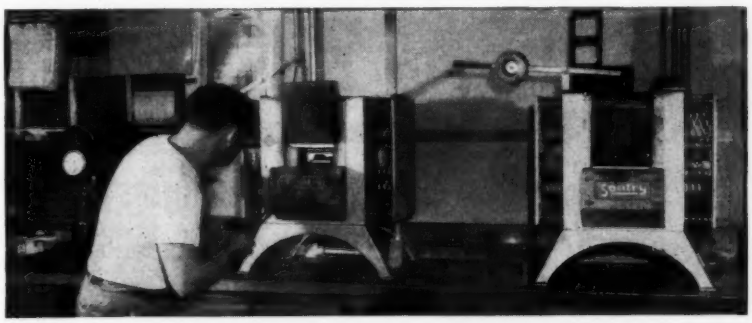

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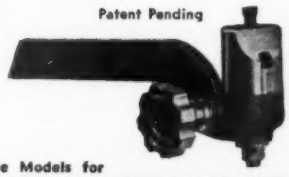

Five Models for
LATHES, SHAPERS, PLANERS AND BORING MILLS.

RANGE ½" TO 3" RADIUS (MODELS ALSO AVAILABLE FOR CONVEX CUTTING, AND CONCAVE RADII TO 6" ON PLANERS, ETC.)

C. B. TEETER
Tool Room Specialties
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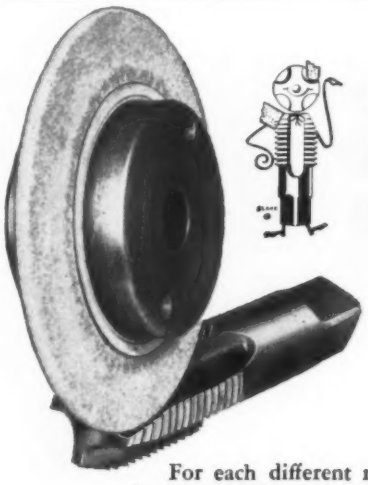
CIRCLE INFORM-A-GRAM KEY NO. 1463



For Profitable Tapping, Grind Your OWN Best Rake Angles!

Controlled grinding of tap flutes and chamfers.

For each different material, there is a "best" rake or hook angle for tapping. You can grind and re-grind this angle on taps for each of your jobs . . . positively and accurately, time after time . . . with the BLAKE Flute Grinder.*

Combined with the BLAKE Chamfer Grinder, this machine can give you substantial savings even with Class 3 or 4 fit standards, because you will have:

1. Best rake or hook angle for the material tapped.
2. Exact indexing of cutting edges.
3. Correct spiral points.
4. Accurately relieved chamfers.

The increased uniformity and accuracy of your threads, plus *far* greater tap life, are the sound basis for maximum savings in your tapping costs.

Ask us for the details of what this combination can do for you.

**Now available with air operated vertical slide.*

EDWARD BLAKE COMPANY INC.
MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS
442 CHERRY ST., WEST NEWTON 65, MASS.

Exclusive Distributors of:
BLACK-DIAMOND PRECISION DRILL GRINDERS • SURFACE FINISH STANDARDS • WORCESTER DRILL GRINDERS

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Empire
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ARE
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THE TAPERED SEAT ASSURES ACCURACY OF ± .0001

Manufactured in all tapers. 1 to 6 MT in stock. Special shanks and points made to order.
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Points illustrated are standard.

Ask your Supplier or Write for Literature
ROYAL PRODUCTS
88 UNION ST. MINEOLA, N. Y.

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MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. 3 No. 100 for 6" Vernier Calipers; 3 No. 200 for 10"-12" Height Gages, also 10"-12"-24" Vernier Calipers; 3 No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.
For Complete Information Write, Phone or Wire

STEBAR COMPANY
215-221 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1465

Step-up feeds, speeds, production . . . finish your cutting tools with

HYPREZ OSCILLATING LAPPING MACHINE

Records prove that the Hyprez Lapping technique increases tool output per grind 200% to 700% — improves speeds and feeds 50% to 400%. The lapping wheels rotate as they oscillate across the firmly held tool—producing a geometrically accurate and scratch-free finish.

For Complete Information ask for Technical Bulletin LST-87

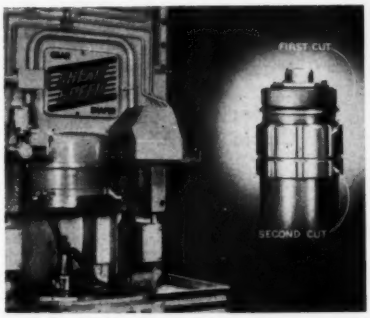
HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. Dearborn St., Chicago 5, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1471

NEW SHAPER HEAD CUTS TWO DIFFERENT PITCH DIAMETERS IN ONE SETUP

A new two position cutting head has been built that makes possible the cutting of two different pitch diameters on one part (as on two-step clutches, etc.) in one setup of the gear shaper.

The heads have been developed by the Michigan Tool Company for adaptation to their Shear-Speed gear shapers. All 1800 series Shear-Speeds now in use can be modified to accept the new cutter head.



Simplicity and speed are operational features of the cutting head. Two sets of teeth are cut in sequence with the head moving to two stop positions. Differential tool feed cuts the varying pitch diameters. The new method, when applicable, eliminates second setups.

In operation, as set up for an automotive shifting ring having two sets of eight teeth in-line but on pitch diameters different by 0.004", the part is manually loaded and hydraulically clamped. The deeper teeth (1.187" long) are cut first. Infeed of the 9-blade cutter is 0.119", after the head slide is locked in cutting position. All tools are fed radially into the work simultaneously.

End of the first operation automatically actuates the head into the second position where it is locked for the second cut. Cutter infeed for the shallower depth teeth is 0.115".

For both operations, 60 strokes at a surface feed of 20.9 fpm is used. Production rate is 60 pcs/hr.

Downfeed of the new cutter head is controlled by an eccentric relief cam and position-held by a double hydraulic cylinder arrangement. Lock action is automatic.

Plastisol-lined tumbling barrels for polishing typewriter keys have solved a discoloration problem at the Underwood typewriter plant in Hardford, Conn. Rubber-lined barrels were previously used for this purpose. The barrels now being used are dip-coated with a Unichrome plastisol made by Metal & Thermit Corp.

For increased output and accuracy, finish your tools and gages with

HYPREZ DIAMOND COMPOUNDS

Virgin Diamond particles, graded in our own laboratories, are uniformly dispersed in the exclusive Hyprez vehicle for maximum cutting action. They produce finer results faster on every finishing job . . . Your nearby Hyprez distributor will help you solve any lapping or polishing problem that may arise.

Write for free demonstration or technical bulletin No. ST-87

HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. Dearborn St., Chicago 5, Illinois

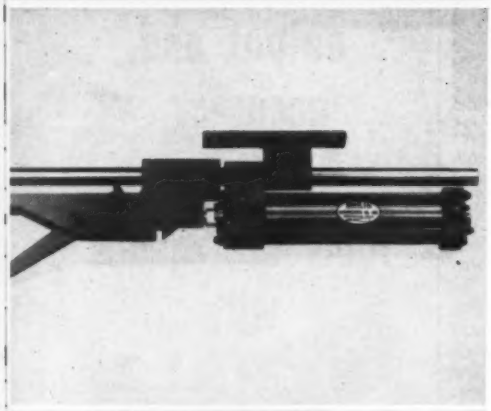
CIRCLE INFORM-A-GRAM KEY NO. 1472

PRODUCTS

NEW DEVELOPMENTS · IMPROVEMENTS · COST AND TIME SAVERS

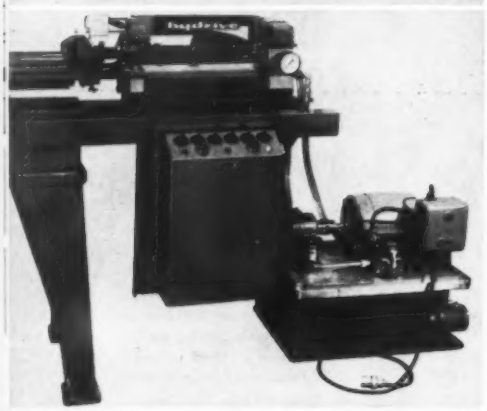
OPTICAL FLATS . . .

Micro-Koted Flats, fused quartz flats, have been coated with a transparent metallic material for durability. Other advantages are improved accuracy and contrast for greater ease in observing fringes. The Van Keuren Co., 176 Waltham St., Watertown, Mass., or — **Circle No. A1.**



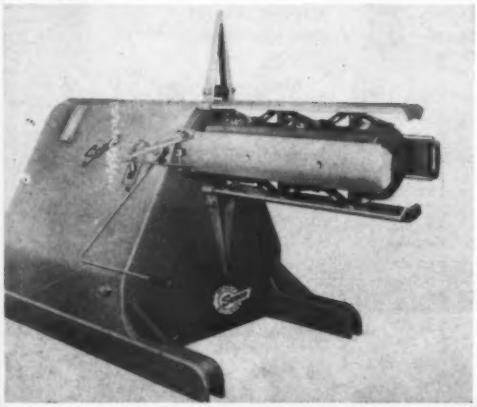
IRON HAND . . .

A 40% increase in gripping forces is obtained with the improved jaw cylinders which are lighter, tougher, and easier to maintain. The gripping area has been made smaller, and tough steel inserts are easily replaced without cotter key and solder methods. Sahlin Engineering Co., Inc., Birmingham, Mich., or — **Circle No. A2.**



TURRET DRIVE . . .

Production increases up to 100% with Acme Hydrive. It powers self-indexing lathes from bench size up to No. 5 turret lathes, improves quality and finish of parts, and cuts rejections. This unit automates the turret, feeds the cross-slide, and changes spindle speed. Acme Industrial Co., 200 N. Laflin St., Chicago, or — **Circle No. A3.**

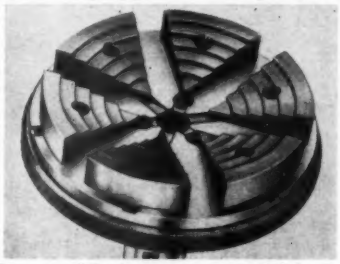


CENTERING REEL . . .

This 15-ton capacity centering reel handles coil weights up to 30,000 lbs on a single spindle. It also handles a maximum coil width of 60", and a maximum coil diameter of 72". Sesco Inc., 8881 Central Ave., Detroit 4, or — **Circle No. A4.**

SCROLL CHUCK . . .

Clamp the largest possible area of the circumference with the new scroll chuck which permits minimum use of pressure. Fragile work is never deformed or crushed. Chucks over 4" capacity are equipped with eight jaws.



Removable jaws are available for internal or external chucking or blank form suitable for individual machining. Six sizes from 2" to 6" fit all machines. Alina Corp., 122 E. Second St., Mineola, L. I., N. Y., or — **Circle Inform-A-Gram No. A5.**

VERTICAL SHAPER . . .

Machine irregular shapes and forms in one setup with the Chomienne Vertical Shaper. Model M-5" features automatic forced feed lubrication, stoke adjustment with direct reading

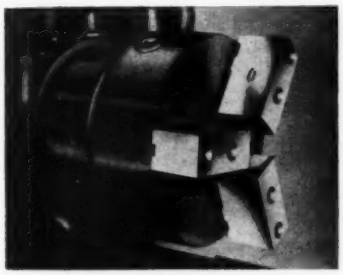
dial, and longitudinal power feed in both directions. This machine performs 42 to 270 spm. Details are found in Bulletin 90 from Austin Industrial Corp., 76 Mamaroneck Ave., P. O. Box 430, White Plains, N. Y., or — **Circle Inform-A-Gram No. A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

CHUCK JAW BLANKS . .

A complete new line of standard chuck jaw blanks are manufactured by Jergens Tool Specialty Co., 712 E. 163 St., Cleveland 10. These soft blanks can be formed to hold all types of



irregularly shaped workpieces. They can be machined to fit the most exacting holding requirements without marring work surfaces and with no need of special face plates or fixtures.
Circle Inform-A-Gram No. A7.

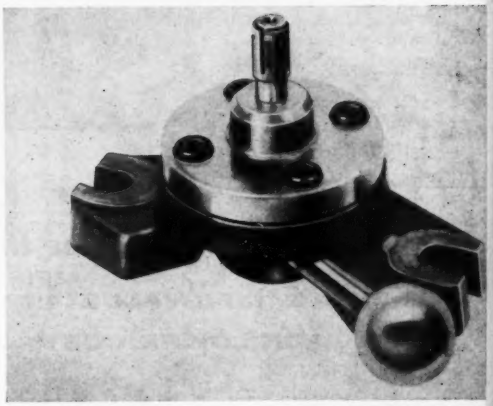
PRESS BRAKE . . .

Featuring totally enclosed construction with entire inboard drive is the newly designed line of press brakes. Available in 30 and 50-ton models with bed

lengths of 6" to 12", this machine is described in Bulletin 90. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y., or —
Circle Inform-A-Gram No. A8.

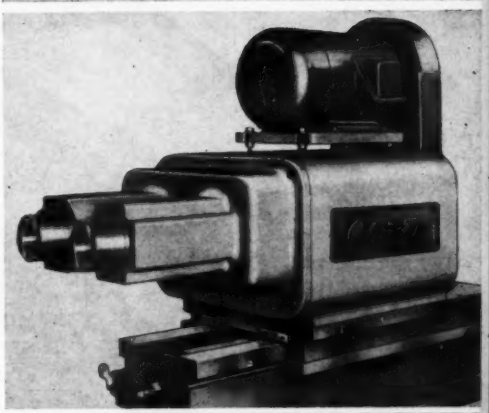
TORK-LOK FIXTURE . . .

Drilling, reaming, and tapping are performed by the Tork-lok fixture. It combines the arbor with a flanged adapter. Seven fixtures range from ½" to 2 9/16". N. A. Woodworth Co., Sales Div'n, 1300 E. Nine Mile Rd., Detroit 20, or — **Circle No. A9.**



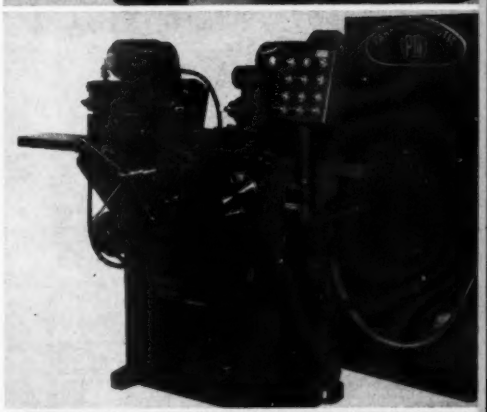
METRIC TORQUE-MATIC . . .

Eliminate drill breakage during deep hole drilling with Metric Torque-Matic. This attachment is calibrated so that a given number corresponds to the desired drill diameter. Avey Div'n, The Motch & Merryweather Machinery Co., Box 625, Cincinnati 1, or **Circle No. A10.**



CONTOUR GRINDER . . .

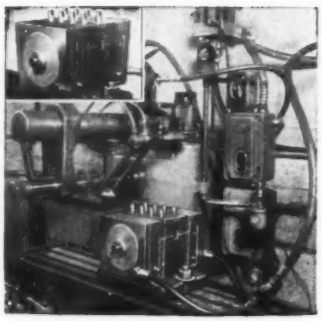
Twisting or grinding is prevented and smooth follower action is insured with the grinder's cam follower workhead. For short run production on several parts the workhead cams are easily changed to enable grinding of many different internal forms. Parker Majestic, Inc., 147 Joseph Campau, Detroit 7, or — **Circle No. A11.**



TEC SPOT GUN . . .

Designed to bridge the gap between resistance welding and arc welding is the Tec Spot Gun. It enables the TIG spot welding of all joints that can be resistant spot welded. Tec Torch Co., Inc., 300 Paterson Ave., Carlstadt, N. J., or — **Circle No. A12.**

Run As Many As Eight Workpieces at One Time using the new multiple milling fixture developed by Multi Engineering Co., Stone Park, Ill. It uses split bushing-type collets that accommodate round, hex, square, or irregular shapes, and features self-equalizing jaw inserts.
Circle No. A13.

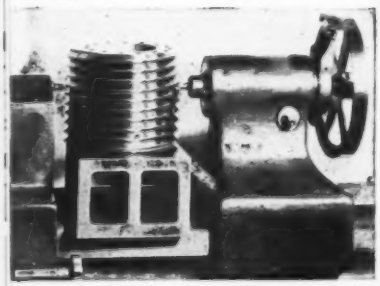


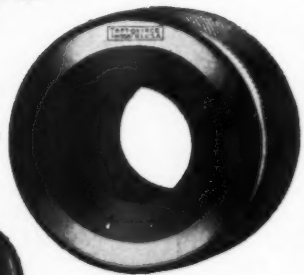
Rotate Pipe and Cylindrical Shapes for flame cutting and welding operations with M-15 portable pipe rotators. Wheel centers on the units are fixed, requiring no adjustment on pipe sizes from 2" to 24". Work can be accommodated up to 8' dia. The Webb Corp., Reed Equipment Div'n, Webb City, Mo., or — **Circle Inform-A-Gram No. A14.**

Taft-Peirce gives three ways to...

PUT EXTRA "LIFE-VALUE" IN YOUR GAGING

FOR LOWER COSTS, HIGHER STANDARDS





ELECTROLIZED
A & B. Limit thread plug gages and cylindrical plug gages are available with individual handles or double-ended. Furnished in Taper Lock, Trilock or Reversible design. Bonus value comes from extreme surface smoothness which reduces friction. Also highly corrosion resistant.

CARBIDE AND NORBIDE
C. All types of cylindrical plug gages can be furnished from Norbide. Extreme hardness imparts long wear resisting qualities.
D. Norbide Ring Gages are particularly suited for accurate inspection of highly abrasive materials or large quantities of parts.
E. Adjustable Snap Gages can be furnished with gaging members faced with tungsten carbide, tantalum carbide or Norbide for extra wear resistance.

Taft-Peirce offers one-source selection of four special materials which make your gaging dollar go much further.

Electrolized, Carbide, Norbide, and chrome plating have characteristics which greatly extend gaging accuracy and wear under different conditions. Electrolized, for example, means the gage has an even film of hard, tough non-magnetic alloy — only .000025" thick — on all gaging surfaces, providing an exceptional wear resistance.

Get Taft-Peirce extra "Life-Value" on your next order. If you want to reduce gaging costs — and promote higher standards at the same time — Taft-Peirce will be glad to use its experience to recommend special surface or material selection. This T-P extra "life-value" will more than pay for itself . . . in better parts inspection and smarter gage buying. For complete listing and prices of Taft-Peirce Fixed Gages, ask for The T-P Handbook.

TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, R. I.

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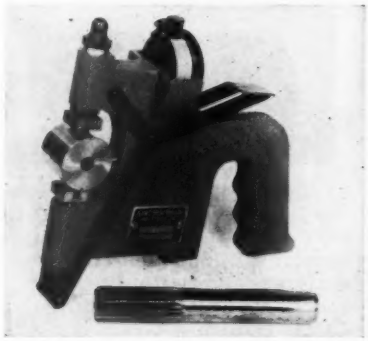
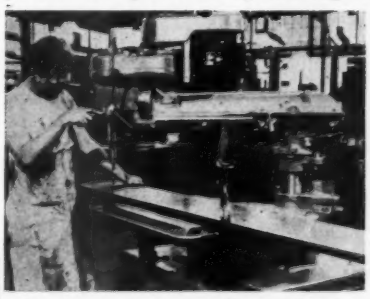
Speed Inspection Operations with a new retractable anvil snap gage. The retractable anvil feature results in faster operation and more pieces checked/hr. The portable gage can be used to inspect work right at the



machine, as well as in the toolroom and quality control section. Sizes range from ¼" to 5". The gage is shown being used to check the rolled spline on an axle shaft. Lincoln Park Industries, 1719 Ferris Ave., Lincoln Park 25, Mich., or —
Circle Inform-A-Gram No. A15.

Reduce Production Costs with an improved line of radial drill presses introduced by Rockwell Mfg. Co., Walker-Turner Div'n, 400 N. Lexington Ave., Pittsburgh 8. They simplify production operations by making it



unnecessary to move jigs and other mounting fixtures. The drill presses are ideal for rapid precision drilling of large or heavy stock, sheet stock, and panels since several widely separated holes can be drilled without moving the work.
Circle Inform-A-Gram No. A16.

A Boring Head That Won't Face is NOT Complete

NOW you can get a boring head that will BORE, FACE, TURN and GROOVE at no more cost than you would pay for a plain, single purpose boring head.

LOOK INTO THIS before you buy that new head. Write for full details.

CHANDLER TOOL CO.
Muncie, Indiana, U.S.A.

Chandler-Duplex
COMBINED BORING AND FACING TOOLHEADS

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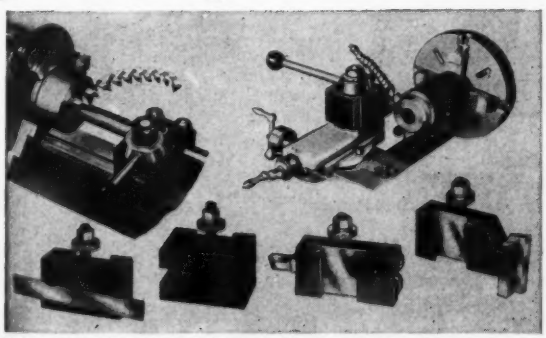
NOW! LATHE USERS CHANGE TOOLS in a ... FLASH ..

ALORIS QUICK CHANGE TOOL POSTS & HOLDERS
Speed Your Operation .... Save You Money



Only a second to change tools for turning, facing, drilling, boring, threading, knurling, cutting off or any other operation.

- Great Repetitive Accuracy
- Rugged Construction
- Tested and Recommended by Leading Lathe Manufacturers
- Greater Rigidity
- Saves 90% in Set-Up Time
- Unconditionally Guaranteed

Write for catalog and price list.

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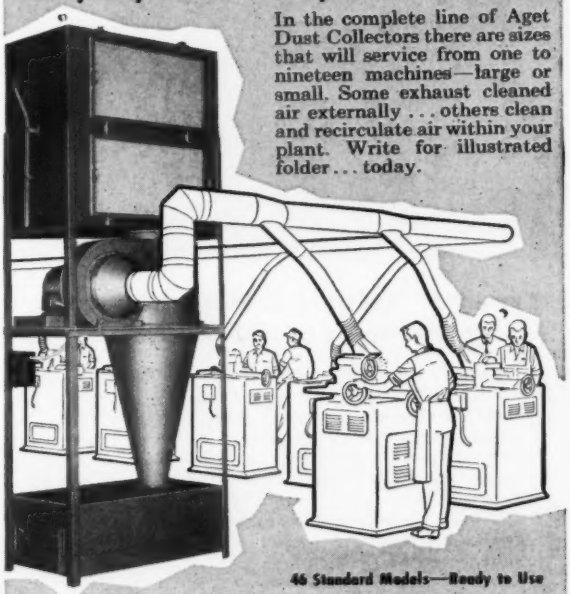
just **ONE** DUSTKOP STOPS DUST
heavy duty unit services up to 19 MACHINES

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally ... others clean and recirculate air within your plant. Write for illustrated folder ... today.



46 Standard Models—Ready to Use

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GEORGE L. DETTERBECK CO. SINCE 1911

World's Largest Exclusive Manufacturer of
SCREW MACHINE TOOLS!

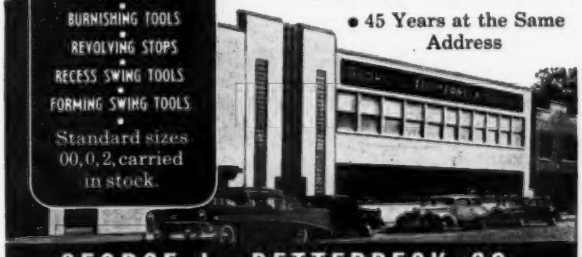
CUTTING CAMS
HIGH SPEED STEEL AND CARBIDE FORM TOOLS
SPECIAL CUTTING TOOLS
SPLIT DRILL BUSHINGS
CROSS SLIDE KNURL HOLDERS
TOOL BITS
BOX TOOLS
BURNISHING TOOLS
REVOLVING STOPS
RECESS SWING TOOLS
FORMING SWING TOOLS
Standard sizes 00, 0, 2, carried in stock.

We specialize in one thing only ... designing and making SCREW MACHINE TOOLS!

45 years experience goes into every tool we make. They come to you ready for use ... Precision design ... Skilled workmanship ... Finest materials.

Our extensive facilities save you TIME ... MONEY ... and give you accuracy, quality and quick service.

• 45 Years at the Same Address



GEORGE L. DETTERBECK CO.
1871 Clybourn Avenue • Chicago, Illinois

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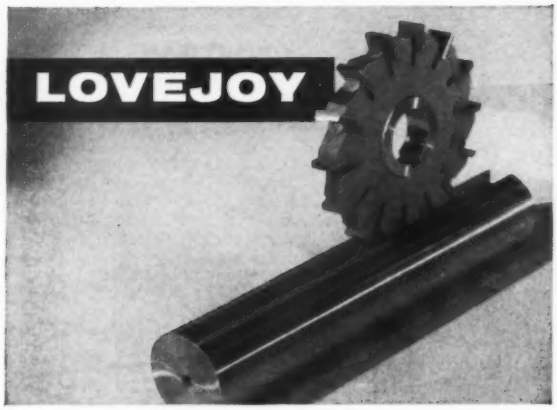


Type "S" Slotting & Milling Cutters
with Pre-formed Solid Carbide Blades

The Lovejoy Type "S" has *more, stronger, more rigid* teeth per tool than any other inserted-tooth milling cutter. One body mills numerous metals. The most economical carbide cutter made — saves on blade replacement and on width and diameter adjustments. *Outstanding performance with Minimum Maintenance!* Write for Catalog No. 34.

NEW "SF" end mill with inserted solid carbide blades. One cutter body mills numerous metals.

Write for Bulletin No. 101

LOVEJOY TOOL COMPANY, INC.
146 Main Street, Springfield, Vermont, U. S. A.

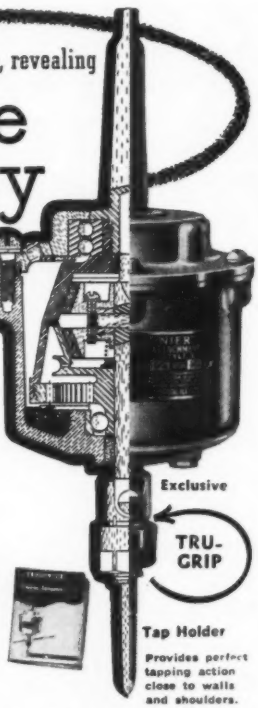
CIRCLE INFORM-A-GRAM KEY NO. 1521

Get the complete, revealing

Inside Story

on the finest tapping heads ever made!

A complete feature by feature analysis on the amazing Procunier Tapping Line is yours for the asking! Gives a true "peephole" story on the many outstanding construction improvements, the mechanical advancements and precision quality operating advantages that make Procunier heads a "must" in production plants everywhere! You'll learn why Procunier means more tapping hours with minimum "down-time", faster production with fewer broken taps, fewer spoiled pieces and a "new-found" operating ease that helps operators maintain stepped-up production schedules. Find out how you, too, can benefit with Procunier in your plant.



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Use this THIN GRIPCO JAM NUT

FOR
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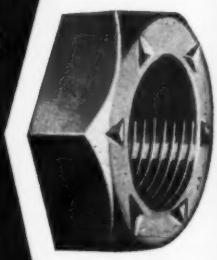
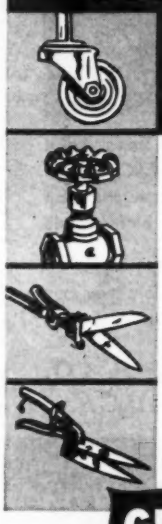
- Casters
- Shears
- Clippers
- Sickle Bars





or wherever you need a positive lock on short bolts where the strength of a full nut is not needed.

GRIPCO JAM NUTS come in the New Unified Finished and Heavy Series (Hexagon), in standard full and jam dimensions, in steel, brass and aluminum.

Gripco Products Include:

Gripco Lock Nuts • New Gripco "Clinch Nuts" Gripco Hi-Nuts • Gripco Pilot-Projection and Countersunk Weld Nuts all with or without the famous Gripco positive locking feature. Also Standard Semi-Finish Nuts.

Write for samples and full particulars.

GRIP NUT COMPANY
117 107 Maple Ave. • South Whitley, Ind.

CIRCLE INFORM-A-GRAM KEY NO. 1523

SWITCH FROM INVESTMENT CASTING TO STAMPED ASSEMBLY SAVES 71%

Short-Run Blanking Dies Cut Unit Cost from $1.48 to 43¢

Investment Casting Cost:
$1.48 EACH IN 1000 LOTS

Complete Stamped Assembly Cost:
43¢ EACH IN 1000 LOTS

An investment casting was formerly used involving additional machining operations. Converting to a brass stamped assembly gave the customer a more accurate, physically superior part at a 71% saving.

Consider D-R Stampings for your products. Send sketch, blueprint or part, plus quantity, for prompt quotation.

DAYTON ROGERS *Manufacturing Company*

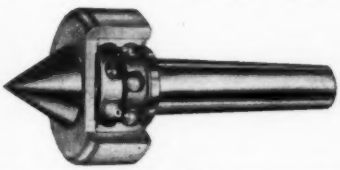
MINNEAPOLIS 7B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 1524

Eliminate Manual Draining with semi-automatic Series 410 moisture separators. They will separate and accumulate all moisture and contaminants passing through the unit

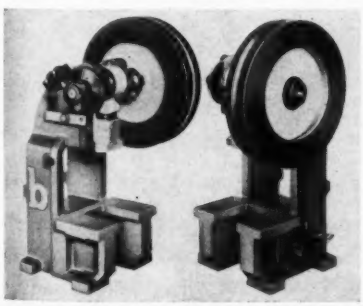
while the air line is in operation. Maximum operating pressure is 250 psi. Wilkerson Corp., Dept. TP, 1640 W. Girard Ave., Englewood 8, Colo., or —
Circle Inform-A-Gram No. A17.

More Practical to Replace than Repair is the Spinose live center introduced by Ideal Industries, Inc., 1334 Park Ave., Sycamore, Ill. This low-cost center with good load capacity



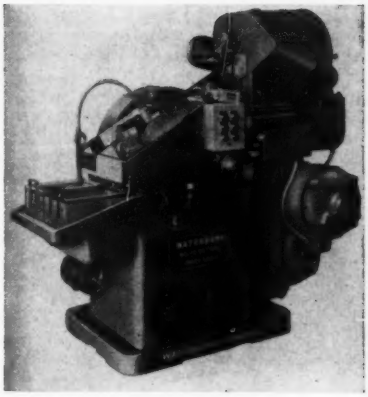
and accuracy, and 2500 hrs average life, answers many needs of maintenance, small machine, and light production shops.
Circle Inform-A-Gram No. A18.

A Special 2-Ton Fixed Bed Gap Frame Press has been produced by Benchmaster Mfg. Co., 1835 W. Rosecrans, Gardena, Calif. It is designed for manufacturing electronic components, and is furnished as a stock

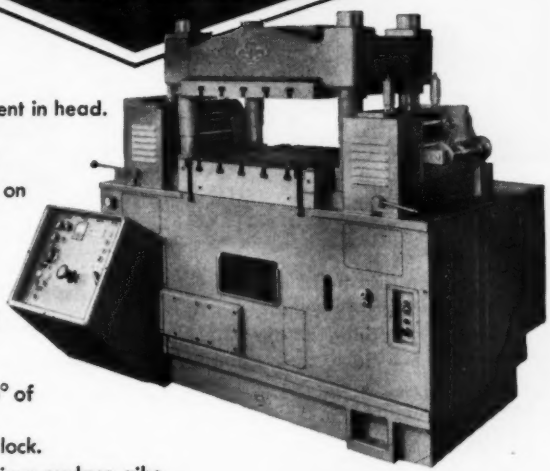


model. The press operates at 280 to 290 strokes/min, and has a 5⅛" die space and a standard stroke of ¾".
Circle Inform-A-Gram No. A19.

Designed for Profitable Thread Rolling Production on Long or Short Runs is a new rotary die threader built by The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. The machine can thread all types of machine screws as well as other headed parts, handling blanks from ¼" to 2" long and thread diameters from No. 6 to ¼". Production rates on blanks of conventional screw materials range from 200 to 600/min and stainless steel blanks can be threaded at from 60 to 200/min.
Circle Inform-A-Gram No. A20.



ALPHA
TWO POINT
BACK GEAR UNDER DRIVE
PRODUCTION PRESSES
Capacity of 75 to 200 tons



Outstanding Features

- Shut height adjustment in head.
- Center drive type herringbone gears.
- Scrap cutter action on up-stroke of press.
- Cam adjustments for brake & roll feeds.
- Micro adjustment of metal travel.
- Timing of scrap cutter from 0° to 45° of up-stroke of press.
- Positive shut height lock.
- Bronze sleeve bearings replace gibs as utilized on conventional presses.

These precision presses are basically precision operating, high-speed automatic stamping presses. They have built-in precision in the same terms as the word "precision" is associated with modern machine tools. This inherent quality has been designed into these presses from the ground up.

NO PITS REQUIRED.

UNBALANCED DIES can be handled without distortion.

FAST, ACCURATE, WILL GIVE LONG TROUBLE-FREE SERVICE and LONG DIE LIFE.

PRESSES UP TO 300 TON CAPACITY, AVAILABLE TO CUSTOMER PARTICULAR REQUIREMENTS.

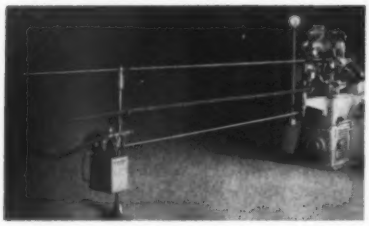
Write for Catalog

ALPHA PRESS & MACHINE, INC.

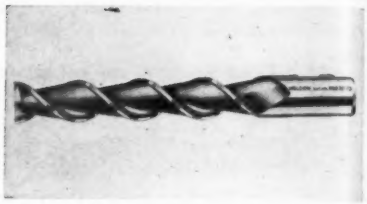
9281 Freeland Avenue • Detroit 28, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 153

Designed to Feed Stock Accurately, even at the high spindle speeds of late model single spindle screw machines, is improved Model S Hydra-Lite hydraulic bar feed. Positive feed-out insures control of lengths within a few thousandths. With the Hydra-Lite there is a minimum of bar end waste, and only one feed-out is needed to feed parts any desired length. Boyar-Schultz Corp., 2000 S. 25th Ave., Chicago, Broadview, Ill., or—**Circle Inform-A-Gram No. A21.**

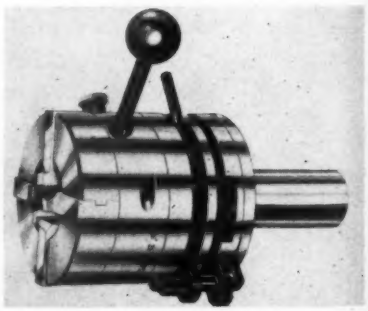


Specially Designed for Cutting Aluminum is the Ski-Kut end mill. The narrow primary flute face minimizes the adherence of chips to the flute face. The advantages of the end mill include greater feeds, longer life, better finish, and easier operation. The Ski-Kut end mill is available from stock in sizes from ¼" to 2" in various lengths. Details are found in Folder SKM-1 from The Weldon Tool Co., 3000 Woodhill Rd., Cleveland, or — **Circle Inform-A-Gram No. A22.**



Greater Ease of Operation, Increased Efficiency, and More Dependable Performance are possible with an improved vertical spindle precision milling machine. The head swivels 360° on the flanged end of the overarm for milling, drilling, or boring at any angle. Adjustable stops are provided for regulating the length of the table feed. South Bend Lathe, South Bend 22, Ind., or — **Circle Inform-A-Gram No. A23.**

An Aligning Shank is a feature of the Geometric 1¼" DD die head. This provides for properly aligning the die head with the work to be threaded, which is necessary for the cutting of accurate screw heads. Shanks can be supplied in the flanged style as well as the straight shanks shown. Greenfield Tap and Die Corp., Geometric Tool Co., New Haven 15, Conn.. or — **Circle Inform-A-Gram No. A24.**



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We design and build machines that automatically handle the part, or casting, through all the machining operations—ready for assembly.

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CIRCLE INFORM-A-GRAM KEY NO. 154

THE NEW IMPROVED **PALMGREN**

Rotary and Indexing Table with Graduated Rotary Feed

No. 86 Table

The No. 86 Rotary and Indexing Table by Palmgren has been a basic tool for years, and now with these new improvements it is even more essential than ever in lowering costs and increasing production in every metal working or wood working shop. Check these features: 8" dia. top with 5/8" x 1" x 5/16" T slots. Rotary Top graduated to full 360° with rotary feed positive through worm and gear with ratio of 40-1. Rotary indexing dial accurately graduated in three minute intervals. Two hold down screws furnished to lock table top in position after indexing. Overall height is only 3¼" which makes the No. 86 an ideal tool for jobs where the fixture is large and takes up too much distance between the spindle and the machine table. Two 5/8" keys and screws are provided for machine mounting. Ruggedly built for years of precision work. #86

ONLY **$69.95**

Order today or send for new Catalog No. 205 complete with prices.

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CIRCLE INFORM-A-GRAM KEY NO. 1551

The ALL AMERICAN Precision Filing Machine

ASSURES 100% VERTICAL FILE POSITION REGARDLESS OF TWISTED FILE SHANKS!

This file setting square used in connection with the patented ball and socket joint file clamp compensates for irregularities in file shanks. A perfect filing job every time. Also saws and hones. Other features include: Precision ground table that tilts 15° front and back, chip blower, variable speed drive — from 170 to 450 strokes per min., lower overarm with file roller guide and slotted bronze saw guide, upper overarm with reciprocal file, saw and hone clamp. Finest machine of its kind. Send for literature.

$245.00 F.O.B. OUR PLANT
Illuminated magnifier or focal lamp, and sawing and honing attachments extra.

MANUFACTURERS OF ALL AMERICAN VIBRATION FATIGUE TEST MACHINES

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high production, single surface grinding

Gardner #122
Semi-Automatic Single Spindle Grinder

Power operated work carrying fixtures provide high output at low cost.

Send for catalog on full line of Gardner Grinders.

GARDNER precision disc grinders

GARDNER MACHINE COMPANY
462 Gardner St.
Beloit, Wisconsin

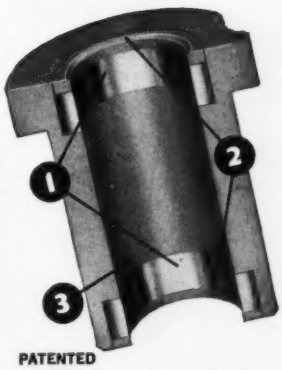
CIRCLE INFORM-A-GRAM KEY NO. 1553

MEYCO CARBIDE INSERTED DRILL JIG BUSHINGS PROVE THEMSELVES *IN Automation!*

The reason is simple: these unique bushings are ideally suited for long-running, uninterrupted operations!

MEYCO carbide inserted bushings assure long life for drills, jigs, fixtures . . . accurate work maintained, resulting in less down-time, fewer lost man-hours. Last almost as long as solid carbide bushings, cost slightly more than ordinary bushings. Get the full story:

Write for information and price list, ask for Catalog No. 41.



PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

EST. 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1554

FRICTION SAWING with Tannewitz

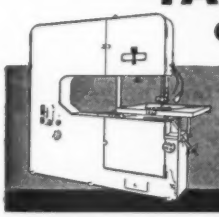
HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS

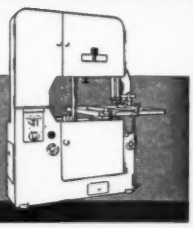
GRAND RAPIDS, MICHIGAN ☎ **GL-6-1729**



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES

for CONTOUR SAWING, FILING, POLISHING

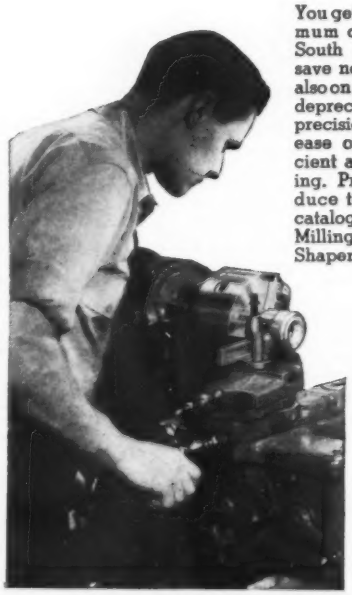
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1561

South Bend

13" PRECISION LATHE



You get maximum value at minimum cost when you choose South Bend 13" Lathes. You save not only on first cost, but also on power, maintenance and depreciation. Their dependable precision and almost effortless ease of operation assure efficient and economical machining. Practical attachments reduce tooling cost. Write for catalog of South Bend Lathes, Milling Machines, Drill Presses, Shapers and Pedestal Grinders.

SPECIFICATIONS

Swings: 13⅛" over bed and saddle wings; 8" over saddle cross slide.

Bed Lengths: 4, 5, 6 and 7 feet.

Distances Between Centers: 16 to 52 inches.

Collet Capacity: 1 inch.

Spindle Bore: 1⅛ inches.

Power Longitudinal Feeds: 48, R.H. or L.H.

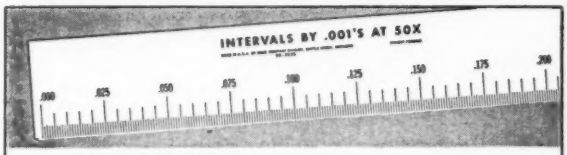
Power Cross-Feeds: 48, .0006" to .0315".

SOUTH BEND LATHE

SOUTH BEND 22, INDIANA

Building Better Tools Since 1906

CIRCLE INFORM-A-GRAM KEY NO. 1562



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Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

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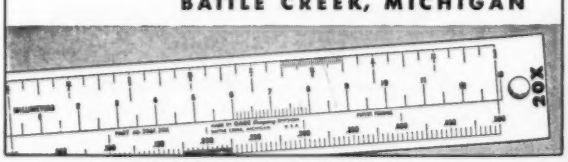
GAGE COMPANY

BATTLE CREEK, MICHIGAN



CIRCLE INFORM-A-GRAM KEY NO. 1563

Combined Boring and Spot Facing Tools can now be obtained from Wesson Co., 1220 Woodward Heights Blvd., Detroit 20. They are made with throwaway blanks for both operations. The boring blank is also

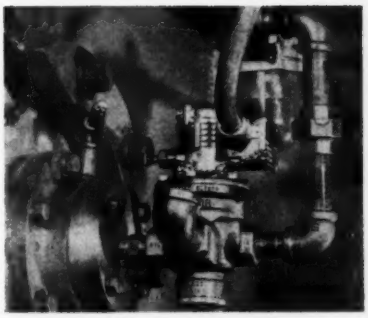
micro-adjustable. Once adjusted, the tool does not need to be reset. When one edge is dulled, the blank is indexed to a new cutting edge. Correct location is automatic.
Circle Inform-A-Gram No. A25.

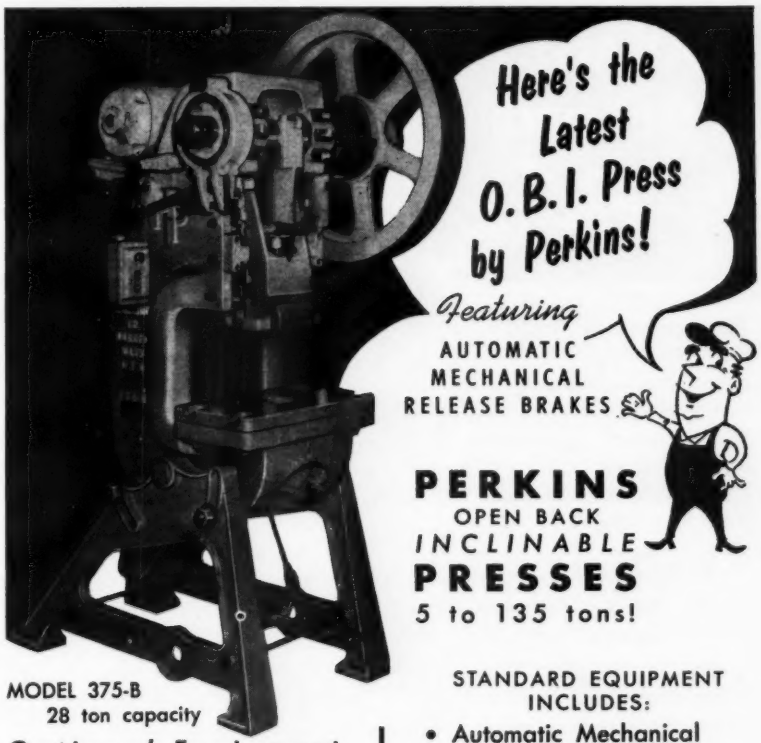
Use Form Relief Flat Step Drills to accomplish multiple internal operations with a single tool on plastics, bronze, brass, and other nonferrous materials. It fits inside the tool opening of any floating or other type holder. Drill blades are locked, yet they are quickly and easily changed without changing the setup. B & W Precision Products Co., P. O. Box 3865, Detroit 5.
Circle Inform-A-Gram No. A26.

Tumbling, Burnishing, and Deburring Operations are handled by Model V-16 multi-barrel finishing unit. It features a variable-speed direct gear drive which eliminates need for chains and sprockets, and permits simple speed adjustments

from 8 to 25 rpm. 16 cu ft capacity, no-seam vinyl barrel linings, and one to four compartment barrels are added features. Rampe Manufacturing Co., 14915 Woodworth Ave., Cleveland 10.
Circle Inform-A-Gram No. A27.

Brake, Clutch, and Other High Speed Applications are handled by a new series of pilot-operated poppet-type in-line control valves. Their fast response shortens machine cycling time, assuring more accurate cuts for high speed cutoffs and increasing work output. Hi-Speed Inline valves are offered in 2 and 3-way types. Sizes range from ¼" to 1" npt for working pressures of 10 to 200 psi. Valvair Corp., 454 Morgan Ave., Akron 11, O., or —
Circle Inform-A-Gram No. A28.





MODEL 375-B
28 ton capacity

Optional Equipment Perkins O.B.I. Presses

AIR CLUTCHES

Variable Speed Drives • Feed Rolls Dial Feeds • Centralized Lubrication • Two Hand Safety Trips Vibration Eliminators • Counter Balances • Tie Rods • Bronze Gibbs • Wheel Guards • Air Ejectors

STANDARD EQUIPMENT INCLUDES:

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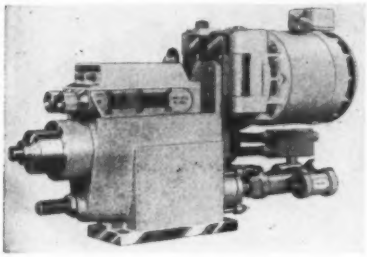
- Bronze Bearings •Semi-Steel Frames
- Single Trip Safety Clutch • One Man Safety Inclining "Features"
- Piston Knock Outs • Bolster Plates
- Motor Drive Arrangements

PERKINS MACHINE COMPANY
WARREN, MASSACHUSETTS, U. S. A.

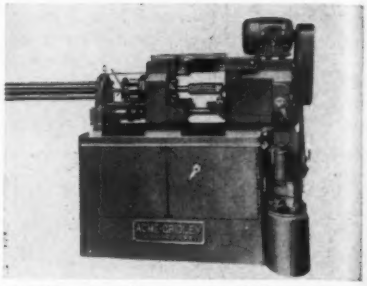
CIRCLE INFORM-A-GRAM KEY NO. 157

A Heavy Duty Drill Unit has been added to the line of Controlled-Air-Power self-contained work devices from The Bellows Co., Akron 9, O.



The Carbi-Drill is used for high speed drilling, reaming, counterboring, precision boring, spot facing, and similar applications. Thirty-five spindle speeds range from approximately 600 to 6000 rpm. Drilling capacity is up to 5/8" dia drill in mild steel. The stroke length is adjustable from 1½" to 4".
Circle Inform-A-Gram No. A29.

Manufacture Small, High-Production Parts with the 7/16" RA-6 multiple spindle bar automatic. The machine measure approximately 5' high and 5½' long. It is arranged for

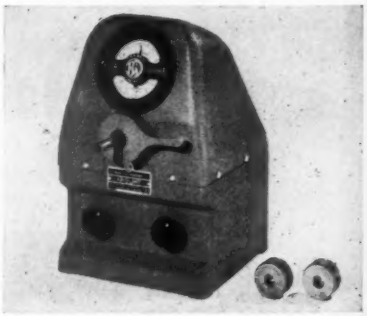


spindle speeds up to 4500 rpm in standard models and up to 3200 rpm in models equipped with spindle stopping mechanism. The National Acme Co., 170 E. 131st St., Cleveland 8, or —
Circle Inform-A-Gram No. A30.

A Complete Line of Self-Contained Dust Collecting Systems is now being offered by The Standard Electrical Tool Co., Mt. Hope & Sixth St., Cincinnati 4, O. The Grind-Air-rester

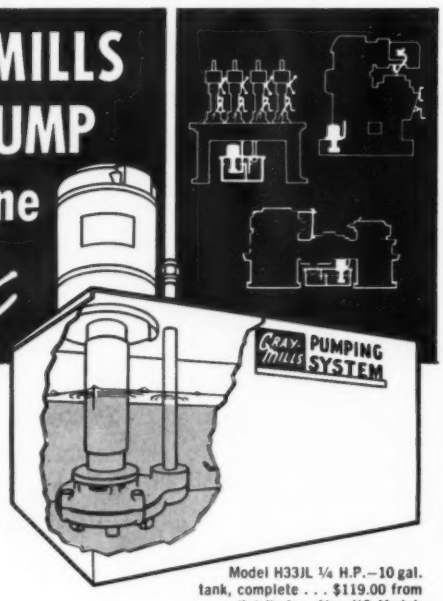
units are available in 7", 8", 10", 12", and 14" sizes. The cabinet base contains the dust collecting system assembled complete with the heavy duty grinder.
Circle Inform-A-Gram No. A31.

Closer Control of High-Precision Production is possible using the Dual-Aire Air-O-Limit comparator. It is designed for use at the machine on close tolerance grinding or lapping



operations, and close tolerance segrating. Provided are two separate magnifications simultaneously without switch-over. Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or —
Circle Inform-A-Gram No. A32.

put a GRAYMILLS COOLANT PUMP on that machine and *Relax*



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2. Abrasive Proof—No bearings, seals or packings to wear
3. Abundant Volume—of coolant or oil, year after year
4. Standard NEMA Motors—extra power for peak loads

Model H33JL ¼ H.P.—10 gal. tank, complete . . . $119.00 from your distributor. Also JIC Model.

Yes, you'll get smooth, steady performance, *at less cost*, with Graymills pumps or units for original equipment, replacement or conversion. That's why more and more machine tool builders are using Graymills. You'll like the personal services too, they are sold by leading Industrial Distributors and Graymills representatives near you are ready to help with special problems. Specify "GM" pumps—install 'em—forget 'em—relax!
Graymills Corporation, 3713 N. Lincoln Ave., Chicago 13, Ill.

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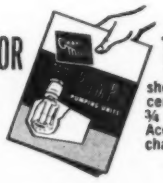
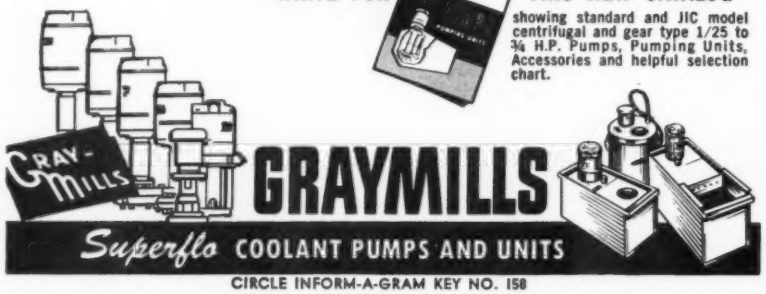


showing standard and JIC model centrifugal and gear type 1/25 to ¾ H.P. Pumps, Pumping Units, Accessories and helpful selection chart.



GRAYMILLS
Superflo COOLANT PUMPS AND UNITS

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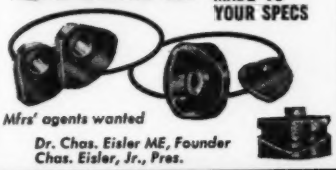
CAMS ALL TYPES MADE TO YOUR SPECS



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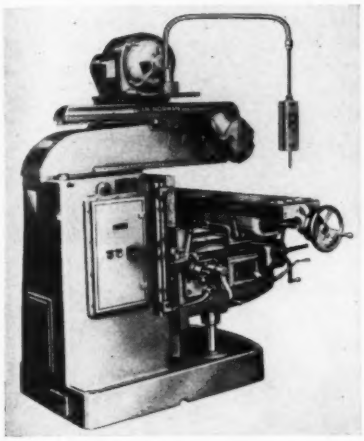

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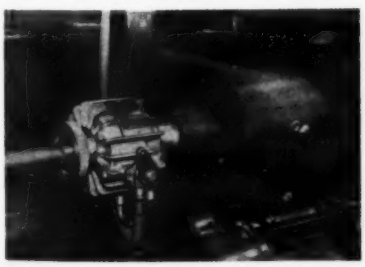

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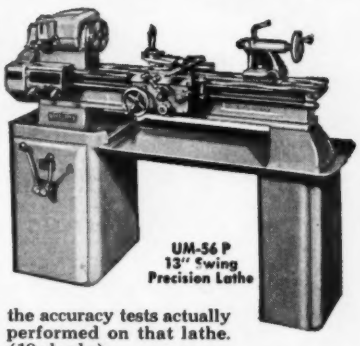

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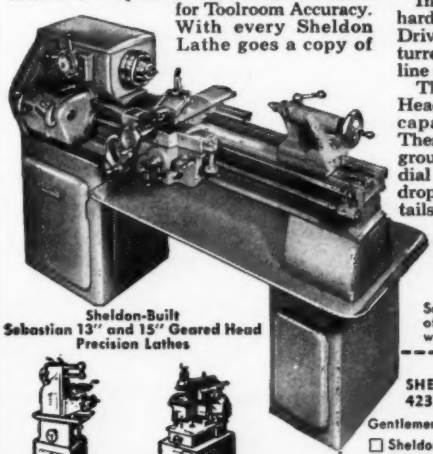

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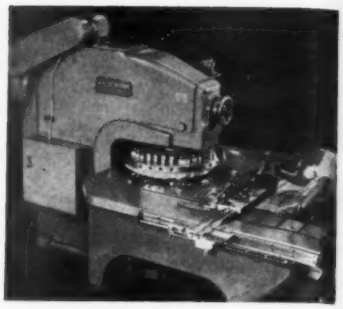

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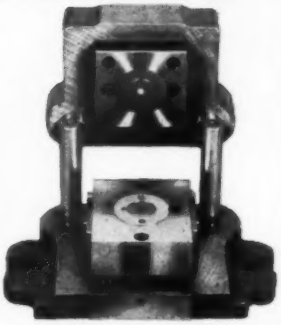

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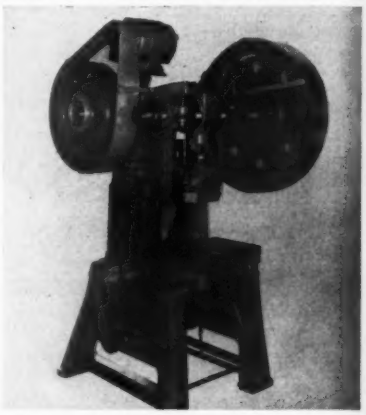

other automatic feed equipment. The standard stroke is 2½" and the press can be arranged for up to a 4" stroke. Sales Service Machine Tool Co., Press-Rite Div'n, 2363 University Ave., St. Paul, Minn., or —
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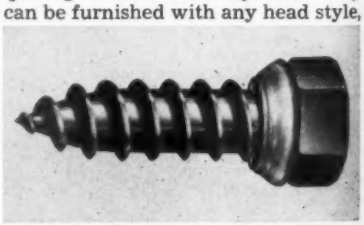

standard production tools can be used. The high-strength, long-life nylon washer will not come off in handling or high-speed production. Parker-Kalon, Div'n of General American Transportation Corp., Clifton, N. J.
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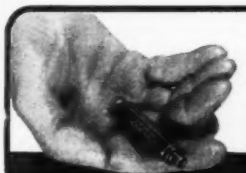

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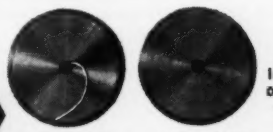

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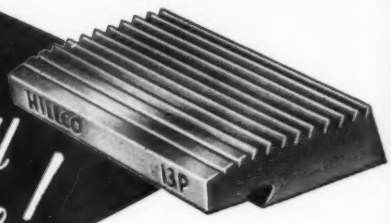

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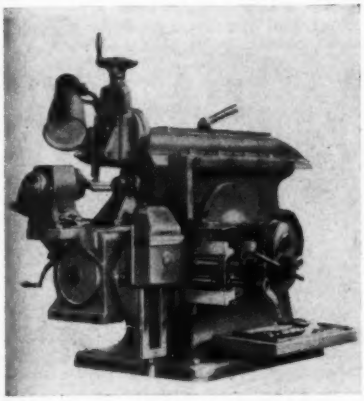

within the working limits of the machine. By switch control the strokes can be changed to either 60 or 120 strokes/min. Jersey Mfg. Co., 456 Livingston St., Elizabeth. N. J., or —
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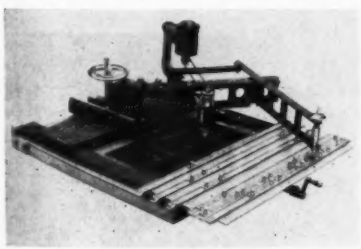
Designed for the Electronic and Electrical Industries is the Engravograph Model I-R. It also engraves over-sized panels which cannot be accommodated by other machines. The pantograph assembly, motor,



and copy table are built as an independent unit on one chassis. This permits panels up to 25" by any length to be clamped on the machine base and engraved over their complete surface. New Hermes Engraving Machine Corp., 13-19 University Pl., New York 3.
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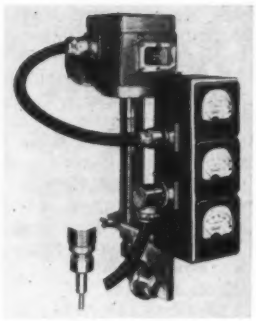
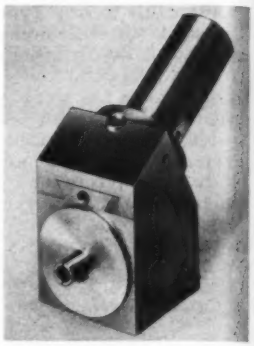
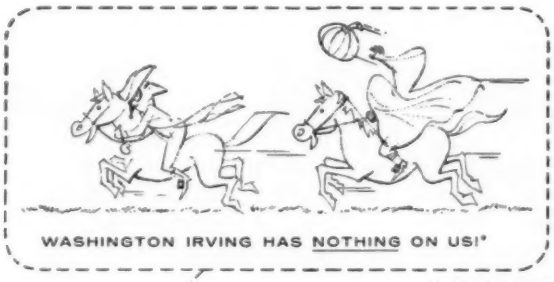
Faster, More Accurate Tracer Setup is possible using the Duplimatic visual indicator setup attachment. It mounts on the tracer unit head giving individual visual reading on each of the three movements of the stylus. Meter calibrations are in milliamps. Tracer Control Co., 595 E. 10 Mile Rd., Hazel Park, Mich., or — **Circle No. A45.**



Radial Marking of Flat or Angular End Surfaces of production parts during the machining cycle is accomplished with an automatic roll marker. The 900 series permits direct in-line mounting with true pitch diameter, and can transfer characters from conical marking die to the flat end face of the part. New Method Steel Stamps, Inc., 149 Joseph Campau St., Detroit 7.
Circle No. A46.





T-J Reamers
have throw-away heads, too!

New Exclusive Design Cuts Replacement Costs More Than Half!

Exclusive in design . . . the New-type T-J Reamers cut your replacement costs *more than half!* Only the quickly installed *head* to replace, after buying original shank. Wide range of interchangeable heads from ⅛" to 2¾" inclusive, in 1/16" increments are available with right or left hand spiral flutes for thru or blind hole reaming.

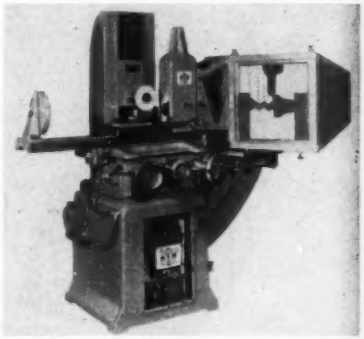
Tapered hole in head insures concentricity and *new* thread design assures a snug fit on smoothly ground tapered shank. Reamer operates free from binding or sticking due to cutting portion wearing undersize and creating negative relief. Backed by T-J's 40 years of know-how as one of the largest manufacturers of die sinking milling cutters. Write to Tomkins-Johnson Co., 617 North Mechanic Street, Jackson, Michigan for T-J Catalog #153-1.

T-J TOMKINS-JOHNSON

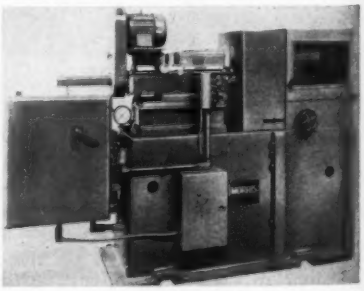
TOMKINS-JOHNSON CO., Jackson, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 166

A Continuous Lubricating System is one of the improvements in the model VG-3 Visual Grind. Other features include a timer belt, 110-volt electrical control, and closer tolerance downfeed control. Visual grind enables the form grinding of steel and tungsten carbide to precision tolerances without stopping to consult a comparator. Continuous grinding and work inspection of intricate forms is possible by through, blind, and combination grinding methods. Cleveland Grinding Machine Co., 1610 Eddy Rd., Cleveland 12.
Circle Inform-A-Gram No. A47.



Increase Efficiency with The Standard Automatic Gun Drilling Machine. Equipped with either 6" or 9" stroke Morris Air-Oil-Matic drill units, the machines are especially efficient for drilling deep holes ⅛" dia and up. They are also suitable for shallow holes where straightness, size, and finish is crucial. The Morris Machine Tool Co., 933-38 Harriet St., Cincinnati 3.
Circle Inform-A-Gram No. A48.



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LAY-OUT DYE
(Purple)

A new, easy-to-use, dependable, spray Lay-Out Dye for tool, die, pattern, or template layout on metal. Dries instantly—shows up in sharp relief.

Also Still Available...

Miccro *Supreme*

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For layout on metal and quick identification of bar stock, sheets, strips, or parts. Also dries instantly and shows up in sharp relief. Available in brush-in-cap cans and larger containers.

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8615 Grinnell Ave. • Detroit 13, Mich.

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- JUMPS SIDEWAYS AS SHOWN WHEN LOCATION IS REACHED.

◄ NEW .500 DIA. MODEL FOR LARGER WORK ONLY. .200 Dia.►

ADJUSTABLE VISE STOP

$2.95

HUNDREDS OF PIECES TO A .0003 TOLERANCE WITH THIS HARDENED VISE STOP THAT IS ADJUSTABLE IN ALL DIRECTIONS. ATTACH TO VISE WITH ONE ¼—20 TAPED HOLE.

Dealer Inquiries Invited

GLOVER MFG. CO.
422 Park Ave. Meadville, Penna.

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Contour Gripping FIXTURE

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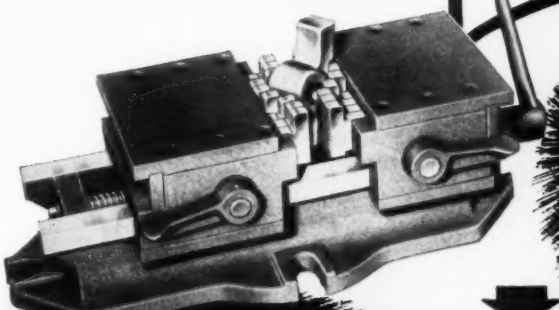

CUTS SPECIAL FIXTURE COSTS

INSTANTLY GRIPS AND HOLDS ANY ODD SHAPED PIECE

TAKE BIGGER CUTS
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- SAFER
- CHEAPER

THOUSANDS OF USES

This amazing fixture holds any shape in any position . . . for drilling, milling, shaping or grinding. It only has to be set once to take identical pieces for any operation on all types of machine tools.

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Compression Spring Assortment

Made from music wire. All sizes in diameters 3/32" to 1-1/2". All 10" long. Select the size required and cut to length wanted. Saves time and money.

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Made from music wire. All sizes in diameter 1/8" to 1". All 11" long with loop or hook at both ends. Cut to length desired.

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Listing numerous tool room needs such as plastic and steel ball handles, machine handles, hand wheels, hand knobs, etc.

Quality at Moderate Prices!

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REID TOOL SUPPLY CO. Muskegon Heights, Mich.

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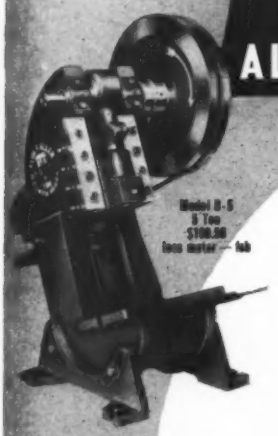
Heavy Duty Bench Type
ALLEN PUNCH PRESSES



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Powerful
Dependable and Economical
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164 Different Model Combinations 1 to 5 Ton Capacities

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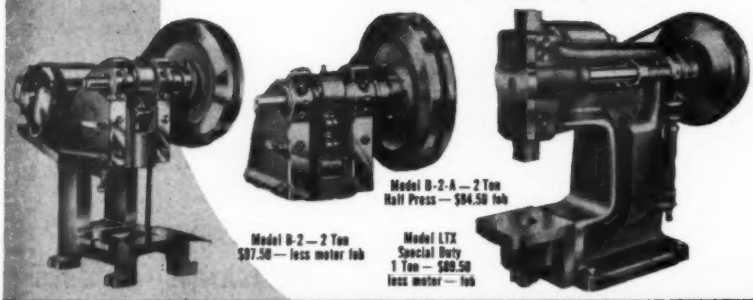

ALVA ALLEN INDUSTRIES Dept. TP Clinton, Mo.

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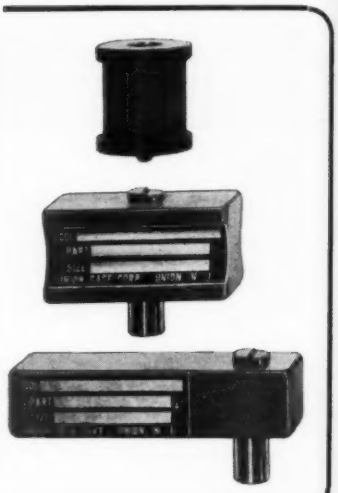

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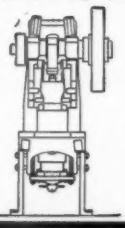
DIE CUSHIONS
FOR ANY PUNCH PRESS FROM ½-TON TO 500 TONS



We invite your inquiries, as we have a complete engineering staff to analyze any of your requirements.

DAYTON ROGERS *Manufacturing Company*
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Since 1903
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TWIST DRILLS—REAMERS

Ever since 1903, when Celfor pioneered in the forging and hot-twisting of high speed drills, "Celfor" tools have been specified by the nation's leading steel fabricators for the drilling and reaming of the really rugged jobs in the toughest alloy steels.

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Magnetic Base Indicator holders

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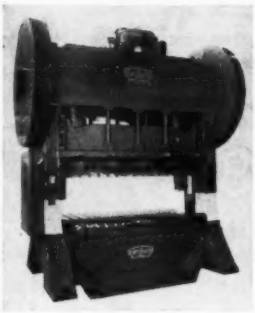
See your dealer or write for catalogue 755 on the most complete line of magnetic base units & access. mfg'd.

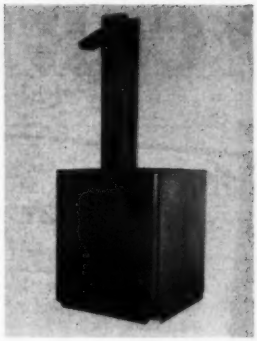
CULLEN MFG. CO., RACINE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 1686

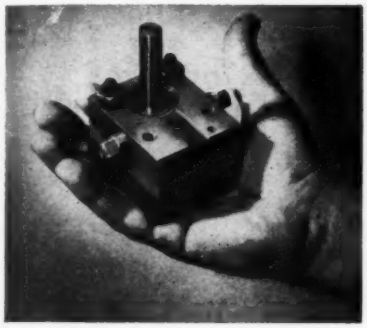
This 200-Ton, Straight-Sided Press is equipped with twin drive and an electrically controlled heavy-duty drum-type friction clutch with air brake. The press has an 8" stroke, shut height of 30", and a 33" x 81" bed opening. Other models range from 75 to 350-ton capacity. The Cleveland Punch and Shear Works Co., 3917 St. Clair Ave., Cleveland 14.
Circle No. A49.



Eliminate Costly Hand Feeding of Parts from storage hopper to production line with Model 7000 elevated bulk hopper. It feeds automatically rolling, headed, or sliding parts into small capacity hoppers or processing machines. Capacity of the hopper is 6 cu ft. Production Feeder Corp., 3130 Johnnycake Ridge Rd., Mentor, Ohio.
Circle No. A52.

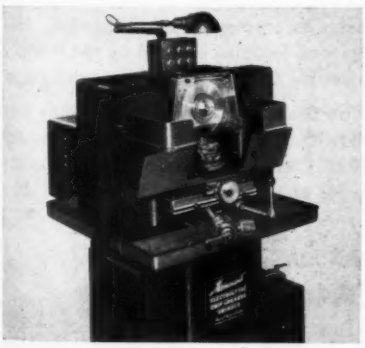


A Compact Low-Cost Wet-Sump Hydraulic Gear-Type Pump is now offered by Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit 13. Its rated capacity is 0.5 gpm at 1000 psi at 1800 rpm. This pump, the Detroit 1000, contains hardened steel



and bronze gears, the latter ball-bearing mounted at both ends. Although initially produced for use within the reservoir, sealed adaptations for mounting externally have been made.
Circle Inform-A-Gram No. A50.

Single-Pass, Full-Depth Grinding is achieved with the Electrolytic Chip Breaker Grinder for 6" and 10" wheels. The spindle is extra heavy and dynamically balanced, and a



tapered spindle nose assures true wheel mounting. One feature is the any-angle vise which accommodates tools up to 2½" wide. Hammond Machinery Builders, 1631 Douglas Ave., Kalamazoo, Mich.
Circle Inform-A-Gram No. A51.

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SET-UP *and* HOLD-DOWN TOOLS

PLANER JACKS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

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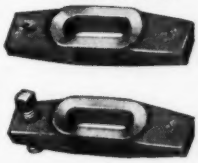
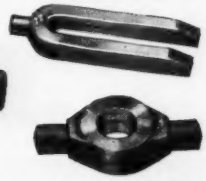
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5220 W. Armstrong Ave., Chicago 30, U. S. A.

T-SLOT CLAMP





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STEP BLOCK

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T-SLOT BOLTS AND NUTS

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*CERTIFIED . . . "up to 3,450 lbs. of clamping force"

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1360-1364 WEST THIRD STREET
CLEVELAND 13, OHIO
MAIN 1-5443

May 11, 1956

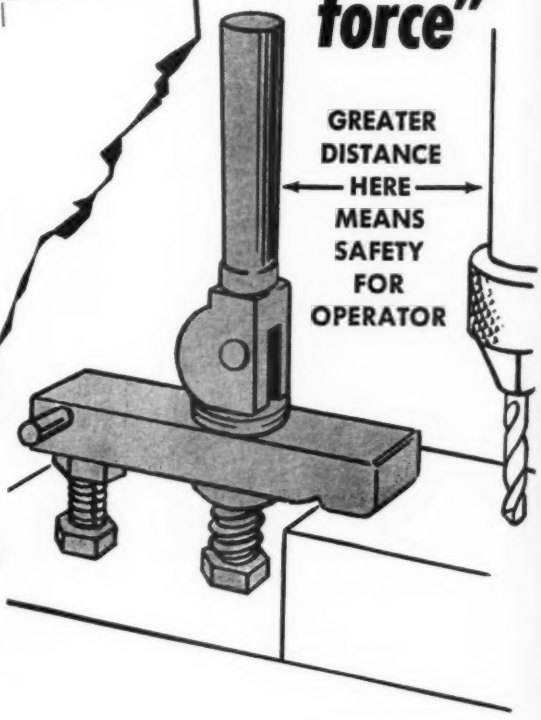
The Standard Parts Company
1000 Broadway
Bedford, Ohio

Re: Our Order N-7281

Gentlemen:

With reference to the Double Cam-Lever (500) and Eye-Bolt (500), we have conducted experiments to determine the amount of clamping force a man can exert with this device, lubricated.

Without the use of any auxiliary equipment, it was found that a man could exert up to 3,450 pounds, by bringing the lever to a position 90° with the Eye-Bolt.



with

STANDARD'S DOUBLE ½" (500) CAM LEVER

This Double Cam Lever offers superior design and engineering features—assuring greater safety, performance, strength and durability.

- **Maximum Job Clearance.**
- **Safe Operation—with handle *vertical* before clamping (as illustrated).**
- **Constant Maximum Clamping Pressure—perpendicular to center line of lever.**
- **Certified 6-Ton Back-Pressure Resistance—no danger of cam backing up.**
- **Ready to Use—no altering needed on assembly.**
- **No Lever Breakage—solid steel handle.**
- **This cam can be applied to your specially designed assemblies. Quotations on request.**

If it's a Standard Part, you know it's GOOD!

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Standard Parts Company offers the most complete line of fine quality tool room standards available today. All Standard components incorporate the latest safety, efficiency and performance features desired by the trade... as typified by the Double Cam Lever shown on this page.

You can depend on Standard Components...they will never let you down (with down-time and work stoppages). Our New Sixth Edition CATALOG—covering our complete line—is now ready for you. Tracing sheets are available.

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56 *pages*

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11	30	49	69	120	158	1172	1393	1471	1592	1671	1772	1852	1934
12	31	51	70	121	161	1173	1401	1472	1593	1672	1773	1853	1941
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16	35	55	103	129	169	1254	1423	1514	1601	1682	1781	1871	
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A7	A25	A43	A61	A79	B12	B30	B48	C5
A8	A26	A44	A62	A80	B13	B31	B49	C6
A9	A27	A45	A63	A81	B14	B32	B50	C7
A10	A28	A46	A64	A82	B15	B33	B51	C8
A11	A29	A47	A65	A83	B16	B34	B52	C9
A12	A30	A48	A66	A84	B17	B35	B53	C10
A13	A31	A49	A67	A85	B18	B36	B54	C11
A14	A32	A50	A68	B1	B19	B37	B55	D1
A15	A33	A51	A69	B2	B20	B38	B56	
A16	A34	A52	A70	B3	B21	B39	B57	
A17	A35	A53	A71	B4	B22	B40	B58	
A18	A36	A54	A72	B5	B23	B41	B59	

Which article in this issue was of most interest to you? _____

Is our cumulative index Page 190 of any value to you? _____

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10	29	48	68	119	157	1171	1392	1465	1591	1643	1771	1851	1933
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15	34	54	102	127	168	1253	1422	1513	1596	1681	1776	1863	
16	35	55	103	129	169	1254	1423	1514	1601	1682	1781	1871	
17	36	56	104	130	170	1281	1441	1521	1602	1683	1782	1872	
18	37	57	105	131	171	1282	1442	1522	1603	1684	1783	1873	
19	38	58	106	132	172	1331	1443	1523	1631	1685	1801	1874	

EDITORIAL ITEMS

A1	A19	A37	A55	A73	B6	B24	B42	B60
A2	A20	A38	A56	A74	B7	B25	B43	B61
A3	A21	A39	A57	A75	B8	B26	B44	C1
A4	A22	A40	A58	A76	B9	B27	B45	C2
A5	A23	A41	A59	A77	B10	B28	B46	C3
A6	A24	A42	A60	A78	B11	B29	B47	C4
A7	A25	A43	A61	A79	B12	B30	B48	C5
A8	A26	A44	A62	A80	B13	B31	B49	C6
A9	A27	A45	A63	A81	B14	B32	B50	C7
A10	A28	A46	A64	A82	B15	B33	B51	C8
A11	A29	A47	A65	A83	B16	B34	B52	C9
A12	A30	A48	A66	A84	B17	B35	B53	C10
A13	A31	A49	A67	A85	B18	B36	B54	C11
A14	A32	A50	A68	B1	B19	B37	B55	D1
A15	A33	A51	A69	B2	B20	B38	B56	
A16	A34	A52	A70	B3	B21	B39	B57	
A17	A35	A53	A71	B4	B22	B40	B58	
A18	A36	A54	A72	B5	B23	B41	B59	

Which article in this issue was of most interest to you? _____

Is our cumulative index Page 190 of any value to you? _____

FIRST CLASS
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CLEVELAND, O.

BUSINESS REPLY CARD

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TOOLING and PRODUCTION

1975 LEE ROAD

CLEVELAND 18, OHIO

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1975 LEE ROAD

CLEVELAND 18, OHIO

Note the complex section of this small ratchet driven friction clutch. Yet, with non-deforming Sagamore Die Steel, there is no distortion or size variation in the intricate webbing.

After being machined from a 3" round bar of Allegheny Ludlum Sagamore, the clutch was hardened from 1775 F. The piece was air cooled and then drawn at 600 F. The result, a Rockwell C hardness of 55/56.

Sagamore is a relatively new type of non-deforming die steel which has had a rapid increase in popularity. It combines excellent non-deforming properties and unusual toughness with freedom from hardening hazards. Similar to high carbon-high chromium steels in behavior and applications, Sagamore has the added advantages of lower hardening temperatures, easier machining and grinding, greater toughness and lower costs.

There's an A-L tool steel to help solve your toughest tool steel problems. For further information, call your nearest office or distributor today, or write . . . *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*

Write for your
SAGAMORE BLUE SHEET

A concise 4-page booklet of facts on the handling and shop treatments of Sagamore. Included is complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. *Ask for your free copy.*

ADDRESS DEPT. TP-92

For nearest representative, consult Yellow Section of your telephone book.

For complete **MODERN** Tooling, call

Allegheny Ludlum

WSW 6623

AL ® FINE TOOL STEELS SINCE 1854

CIRCLE INFORM-A-GRAM KEY NO. 171

Downtime Is Reduced with a new line of quick-change tools on multiple-spindle automatics. Preset tooling guarantees accurate reproduction of parts and eliminates in-the-machine adjustments. Operation of the machine at the optimum cutting speed gives lowest machine cost per piece produced. Scully-Jones & Co., 1916 South Rockwell St., Chicago 6.

Circle Inform-A-Gram No. A53.

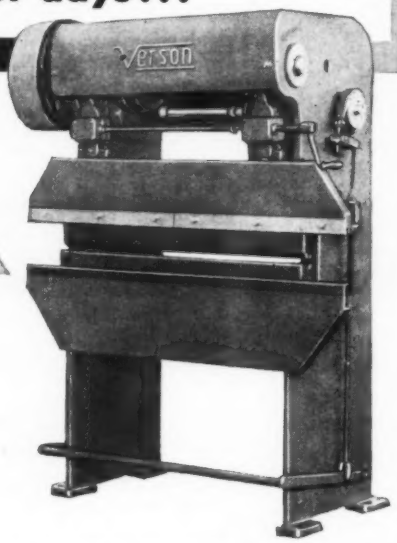
Adaptable for Long-Run Inspections are Golden Emre series dial indicators. They permit direct comparison with specifications, and are suited to either production line or laboratory use. These indicators are available with graduations of 0.0001", 0.0005", or 0.001". An accuracy of ⅛ graduation is provided. Petz-Emery, Inc., Pleasant Valley, N. Y.

Circle Inform-A-Gram No. A54.

$1600*

will put this Power Press Brake to work in your shop in a matter of days...

IMMEDIATE DELIVERY FROM STOCK



STANDARD DIES

48" long, 90° "V" dies for handling 16 ga. stock in the 16-48 are priced at $102.

If you're trying to "get by" without a power press brake . . . or if you're tying up big brakes on small jobs . . . here's the answer to your problem — a rugged Verson Model 16-48 press brake. You can get one right "off the shelf" for only $1600*. You get the famous Verson all steel construction plus proved-in-service Verson design. Capacity is 16 ga. x 48" of mild steel. Write for complete specifications and then place your order. That's all there is to it . . . no involved proposals . . . no delays.

Prices F.O.B. Chicago, less dies; subject to change without notice. 160

Verson

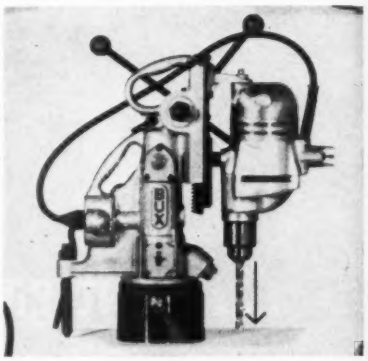
ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9335 S. Kenwood Avenue, Chicago 19, Illinois
8300 S. Central Expressway, Dallas, Texas

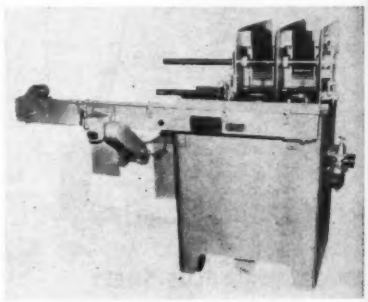
CIRCLE INFORM-A-GRAM KEY NO. 172

A Mechanical Radial Positioner increases the accuracy of Bux portable magnetic drill press unit. The positioning device enables the drill point to be rotated a full 330°. Its lateral movement allows for precision alignment of the unit for drilling, reaming, and tapping. The positioner is available on all models of Bux portable drill press units at optional extra cost. Buck Mfg. Co., 1355 N. 10th St., San Jose, Calif.



Circle Inform-A-Gram No. A55.

High-Speed Feeding of Two Production Parts at one time is a feature of Model 1700-N Feedall Bar Feeder. Using a dual automatic feed, the machine operates at 50 pcs/min in a continuous stream of oriented parts flowing into a centerless grinder. Two feed chutes selectively arrange the parts on an external feed track, orienting them to flow into the production machine at any desired speed. Feedall, Inc., 38399 Pelton Rd., Willoughby, Ohio.



Circle Inform-A-Gram No. A56.

LW MAGNETIC CHUCKS

GRIP WORK TIGHTLY

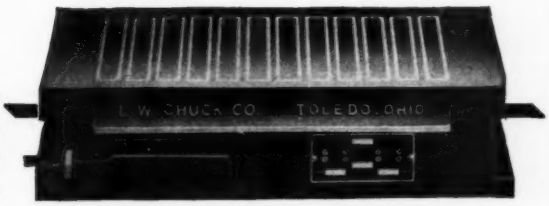
for Wet or Dry Grinding

Guaranteed Waterproof.

Connections for either 110 or 220 v. D. C.

WORKING SURFACE

5¾" x 13" $ 80.00
6½" x 18" $100.00
8" x 24" .. $213.50
10¾" x 37" $375.00



DEMAGNETIZERS

Instantly demagnetize tools or production parts. No moving parts. 110 volt., 60 cy. A. C.

RECTIFIERS
A. C. input 110 volts. D. C. output 110 volts. P-1 for 5½" x 13" chuck 0.8 amps. $57.50
P-2 for 6½" x 18" chuck 1.0 amps. $68.75
P-3 for 8" x 24", 10¾" x 37" chuck 3.0 amps. $87.50

DEMAGNETIZING SWITCHES
For 5½" x 13" and 6½" x 18" sizes. $15.00
Field discharge type for 8" x 24" and 10¾" x 37". $27.00

PLATE-TYPE

MODEL B-2
7¾" x 12½" x 6¾"
Ship. wt. 55 lbs. $78.00

MODEL J-1
7¼" x 7¼" x 6¾"
Ship. wt. 35 lbs. $54.00

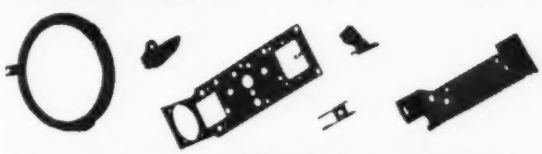
ROUND TYPE
3¾" opening
$27.50

See Your Dealer or Order Direct, Giving Dealer's Name

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products
L-W CHUCK COMPANY
72 SO. ST. CLAIR ST.
TOLEDO 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1731

STAMPINGS - - - SHORT RUNS



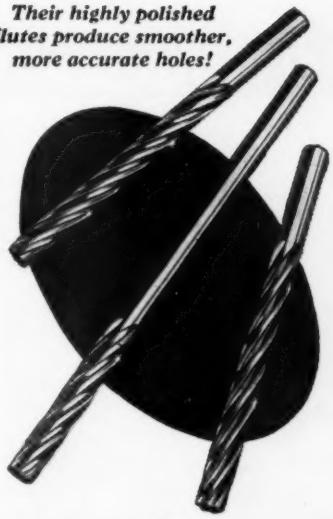
A dependable service for small quantity requirements for new developments and production up to 50,000 pieces. QUICK DELIVERY — ACCURACY — backed by 25 years' experience.

SMALL LOT STAMPING CO.

HUnter 6-3700 Dedicated to Short Runs" 1025 W. Blancke St. Linden, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 1732

Their highly polished flutes produce smoother, more accurate holes!



ACE

Drill Length and Chucking

REAMERS

For the finest reamers that money can buy, always specify "ACE"! They're made of top quality, prehardened high speed steel and produced by the Ace-originated "ground-from-the-solid" process. Results? Stronger, more highly polished right hand spiral flutes. Keener, longer lasting cutting edges. Plus smoother, more accurate holes at lower cost!

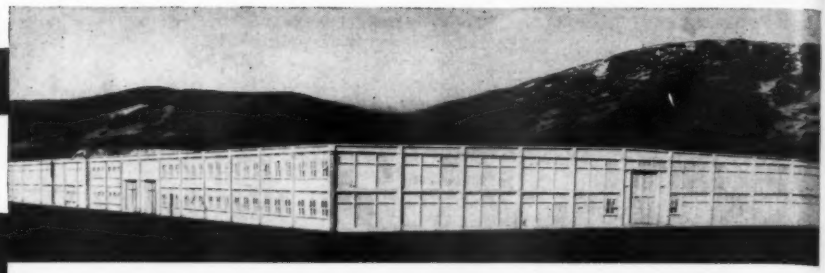
Call your local Ace Drill Distributor today!

NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

ACE DRILL
ADRIAN, MICHIGAN
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1733

At Narsarssuak



ONE ROTABIN-EQUIPPED WAREHOUSE NOW STORES 32,000 SUPPLY ITEMS

Between 800 and 1000 line items are stored conveniently in each 3-foot-diameter Rotabin at the new base supply warehouse at Narsarssuak Air Base (NEAC).

Before the new warehouse was built, base supplies had been stored in 55 temporary shelters. Now, the space savings inherent in Rotabin storage methods bring all items into easy accessibility—a vital factor in Narsarssuak's snow-isolated efficiency.

"How to Double Your Warehouse Capacity" is a free booklet showing how diverse warehousing operations have benefited through F-G-M know-how. Send for it.

The Frick-Gallagher Mfg. Co.
106 So. Michigan Ave.
Wellston, Ohio.

FGM

Technique and Know-How
. . . increases storage capacity
. . . reduces servicing time

CIRCLE INFORM-A-GRAM KEY NO. 1741

FREE

helpful data on uniform carbide performance

Here's what it contains:

- Tells why carbides of the same grade perform differently under identical machining conditions
- Tells what every carbide user should know about the variables that control the making of cemented carbides
- Reveals tests you can use to check carbides for quality

. . . all this and more in an eight page bulletin that originally appeared as a technical article in Carbide Engineering. Send for your copy today.

FIRLOMET

FIRTH LOACH METALS, INC.

Buttermilk Hollow Road, McKeesport, Pennsylvania
"Carbide Makers—Not Fabricators"

CIRCLE INFORM-A-GRAM KEY NO. 1742

HELIOS

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Guaranteed Accuracy Within .001" Reading .001"

- SPEED
- PRECISION
- DEPENDABILITY

6"
$31.80
F.O.B. New York

Full scale reading of 5" — 6" — 8" — 10" Available. Also Foot with Scriber to convert to Vernier Height Gage.

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CIRCLE INFORM-A-GRAM KEY NO. 1743

POSITIVE GRIP
•
SPEED
•
ADAPTABILITY

Model J

AIR-POWERED TOOLMAKERS VISE

UNIVERSAL DOUBLE SWIVEL

Can be adjusted to any position without removing work from jaws. Furnished with hardened steel jaws and brass caps. Operated by a 6" air cylinder manufactured by Yost. Control kit included with each vise consisting of foot treadle valve, quick exhaust valve and 2 lengths of coupled hose. Jaws can be pre-set to any desired opening. Vise can also be operated manually. Jaw width — 4"; jaw opening — 6"; approx. wt. — 90 lbs.

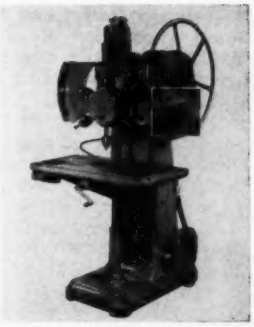
Write today for bulletin on the complete Yost line

YOST MFG. CO., Cambridge Springs, Pa.

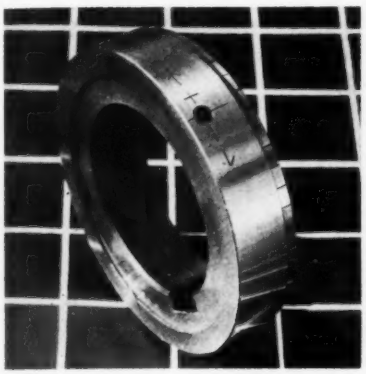
CIRCLE INFORM-A-GRAM KEY NO. 1744

At Least 500 Parts can be marked in an hour with the Vibro-Mark. High cycle, vibratory strokes are used, eliminating strain on marked parts. It can also be retooled for changes in production to suit the individual needs. Defiance Machine and Tool Co., 1920 S. Vandeventer Ave., St. Louis 10.
Circle No. A57.

A Counterweight Spring has been added to the Burgmaster 2B Model turret drill. This feature provides sensitive counter balance for the turret and slide, regardless of weight of tooling mounted in the turret head. Model 2B has a drill capacity of ¾", and spindle speeds range from 225 to 3000 rpm. Burg Tool Manufacturing Co., Inc., Gardena, Calif.
Circle No. A60.

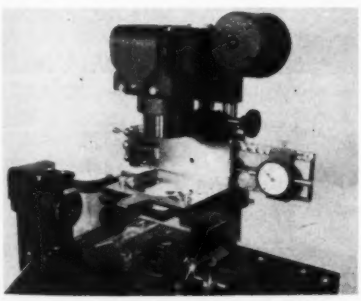


A Micrometrical Adjustable Spacing Collar for milling machine cutter arbors has been produced by Dayton Rogers Mfg. Co., Minneapolis 7. Sizes range from ⅝" to 3" for all standard



cutter arbors. Graduations are spaced so that a 0.001" adjustment can be made. The collar can be used where gang milling machine cutters are in operation.
Circle Inform-A-Gram No. A58.

Utilize All Light with The Surface Illuminator Attachment for use on all optical comparators. It features two reflecting mirrors used in parallel. The first mirror reflects the light on the part and the second mir-



ror returns the beam. This attachment is useful when inspecting a shape which cannot be projected by the shadow outline or silhouette method. Portman Instrument Co., Inc., Town Dock Rd., New Rochelle, N. Y.
Circle Inform-A-Gram No. A59.

FOR ACCURATE ALIGNMENT USE **UNIVERSAL** LOCATING PINS

Threaded Pin

Lock Screw Pin

Relieved Press-Fit Pin

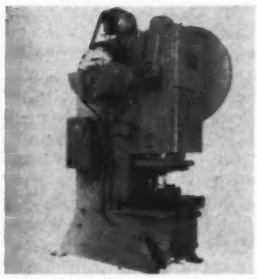
Hardened and ground to close tolerances, precision-made Universal Locating Pins insure quick, accurate alignment, through even the longest, toughest production runs. And their cost is substantially less than ordinary tool-room pins. Stocked in all standard sizes for immediate delivery . . . in round or relieved, press-fit, threaded or lock screw types. Write today for 98-page catalog describing the complete line of Universal quality products.

203

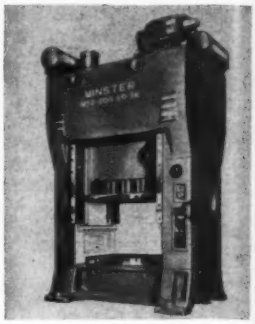
UNIVERSAL ENGINEERING COMPANY · FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 175

Useful for Both Large and Small Production Runs in blanking, forming, drawing, bending, and assembling operations is the O.B.I. mechanical gap press. It features pneumatic counterbalance cylinders as standard equipment. The press is made in four capacities: 75, 110, 150, and 200 tons. A. B. Farquhar Div'n, The Oliver Corp., 126 Duke St., York, Pa. **Circle No. A61.**



Higher Single Stroke Efficiency is a feature of the MS2 press with an air friction clutch and brake unit. This press has a wide speed selection, and is available in capacities ranging from 150 to 500 tons. Minster Machine Co., Minster, Ohio. **Circle No. A62.**



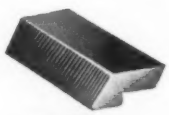
ONE TOOL, CHANGEABLE BLADES

FOR ROUGHING, SEMI-FINISHING, FINISHING

RAPIDOR
TURNING TOOLS

ROUGHING

SEMI-FINISHING



FINISHING

That's right! *One* holder for *three* different lathe operations . . . just change blades for roughing, semi-finishing or finishing. Nothing to it. And here's how Rapidor Turning Tools save you time and money...

1) Tool holder is set on center—blades are set automatically for quick original set-ups.
2) Blades are interchanged without moving holder —cuts down on change-over time.
3) Blades are resharpened from top only—cuts down expensive grinding time.
4) One holder will hold several different blades—keeps inventory to minimum.
5) Blades give long life due to unique shape and design.
6) Carbide tipped blades are designed so that maximum length of carbide is useable.

Sound good? It is! Write Bokum for complete information. Write today!

Blades available in H.S.S. or Carbide-Tipped

TRADE MARK REG. U. S. PAT. OFF.

BOKUM TOOL CO. INC. 14775 Wildemere Ave. Detroit 38, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 176

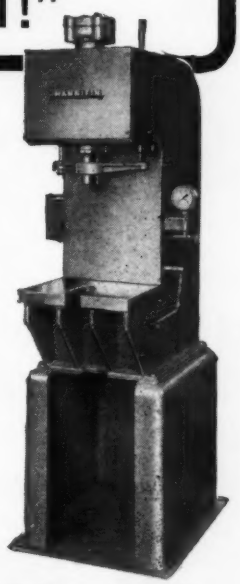
Perfectly Balanced Production is achieved with Lowerator self-leveling work positioner. As material is placed on the positioner's platform, the calibrated spring mechanism permits it to descend in direct ratio to

the weight of the material. The platform goes down as more weight is added, while the top layer of material remains at the same work-level. American Machine & Foundry Co., Lowerator Div'n, 261 Madison Ave., New York 16, or — **Circle Inform-A-Gram No. A63.**

A Storage Unit for No-Roll Parts handled in automated processing lines has been developed by the Gear-O-Mation Div'n, Michigan Tool Co., 17140 E. Ten Mile Rd., East Detroit, Mich. This equipment is designed for interlocking parts that do

not normally roll, but the unit can also be used for normally rolling parts, too. Capacity for this model is 600 parts using two internal levels or tiers. **Circle Inform-A-Gram No. A64.**

"BEST $1530 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

Hannifin Corporation, 563 S. Wolf Road, Des Plaines, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1771

HARDENED and GROUND HSS BLANKS

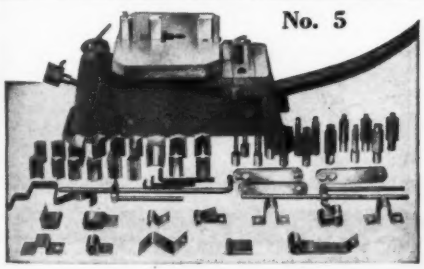
Any decimal diameter — any length. Mirror finish surface to gage tolerance.

Many uses — —core pins, punches, gages, ejector pins, insert pins, special tools, etc. — Quick delivery.

Write or phone DRexell 6-4223 for price list D-3

WILLIAM T. HUTCHINSON CO.
53 Brown Ave., Springfield N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1772



No. 5

WRITE FOR DESCRIPTIVE CIRCULAR

Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x4" air operated.

ALSO AIR OPERATED MODELS

J. A. RICHARDS CO. KALAMAZOO, MICH.

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You Get Things Done With Boardmaster Visual Control

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☆ Facts at a glance — Saves Time, Saves Money, Prevents Errors
☆ Simple to operate — Type or Write on Cards, Snap in Grooves
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GRAPHIC SYSTEMS

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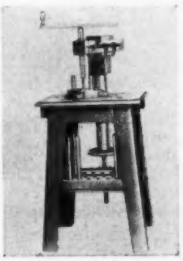
CIRCLE INFORM-A-GRAM KEY NO. 1774

NO BREAKAGE

PRODUCTO UNIVERSAL HAND TAPPER



For accurate hole-tapping without tap breakage, this Hand Tapping Machine is a "must" for every tool and die shop and toolroom. You can tap holes at any point in work within area of machine table. Quick-change spindles hold taps. Ready for instant use. Write for Bulletin TE4-102.

The Producto Machine Co.
970 Housatonic Avenue
Bridgeport 1, Connecticut

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LIFTING DEVICES

for FAST • SAFE • BETTER Material Handling of

• SHEETS
• COILS • BOXES
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• DRUMS • PALLETS

400 MODELS

Prompt Delivery
Write for full particulars

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CIRCLE INFORM-A-GRAM KEY NO. 1776

If You want to PRODUCE MORE

. . . develop Your

PARTS FEEDING

with VFC

BASIC EQUIPMENT

MOTIVATION . . .

. . . AUTOMATION

VFC HAS A CHARTED COURSE THAT WILL HELP YOU!

The real impelling force at VFC, aside from developing better parts feeding equipment, is how to help industry produce more.

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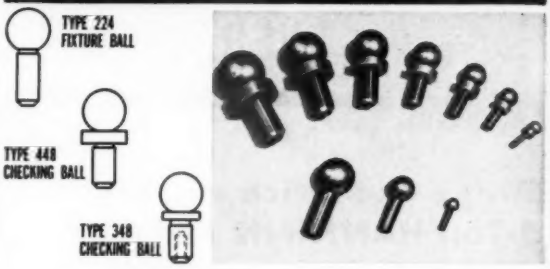

- For gage, jig and tool work. Center of ball provides positive reference point for work in any plane.
- Highly accurate. Ball size held to ±.0001" for fixture balls; ±.00002" for checking balls.
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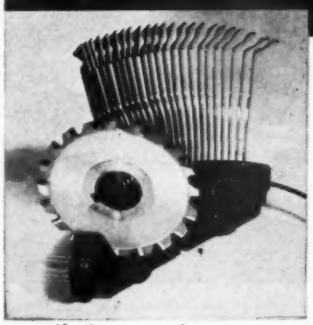

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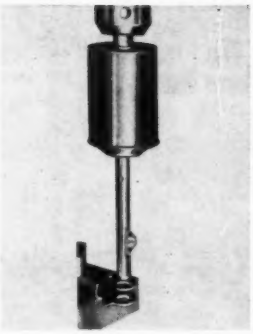
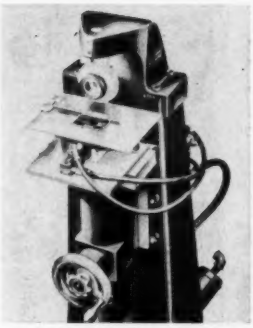
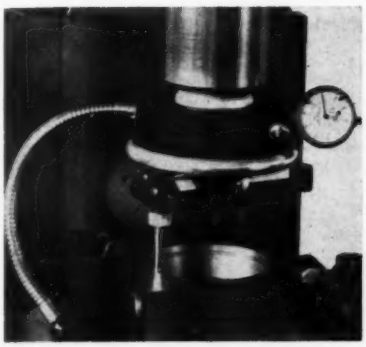
Circle No. A65.



Mark Details into Nameplates or other metal components with a power detail stamping machine. It handles nameplates from 1/32" thick to die components or other parts up to 4" thick. Shop air pressure requirements for power varies from 20 to 40 lbs. George T. Schmidt, Inc., 4112 N. Ravenswood Ave., Chicago 13.
Circle No. A68.



True Bores and External Diameters in setting-up operations on milling machines, lathes, jig borers, etc. with a center locating tool. Centricator Tool Dial Gage does not



rotate with the machine spindle, but remains stationary for convenience and speed. The slide in which the contact tip pivots is adjustable between 5/64" to 11¾" I.D. and 0-11¾" O.D. Opto-Metric Tools, Inc., 137 Varick St., New York 13.
Circle Inform-A-Gram No. A66.

300-Lb Capacity Is a Feature of the improved Jaco Automatic Stock Reel with a heavier base. The solid platen permits application of cutting lubricant to the stock as it lies on the

platen. The coil need not be centered, and there is no danger of the reel tipping because the coils lie flat and close to the floor. Jaco Devices, Inc., 100 High St., Hingham, Mass.
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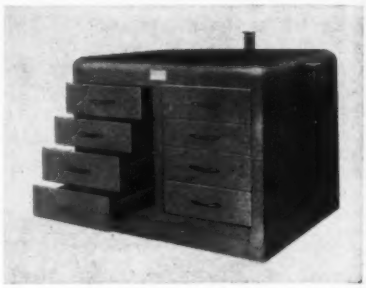
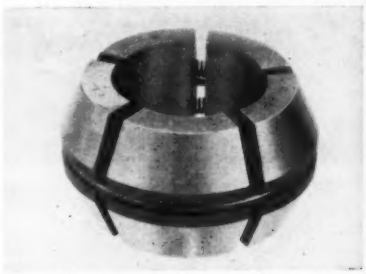


will handle parts or materials that require pre-heating, drying, or baking in temperatures to 325°F. Grieve-Hendry Co., Inc., 1401 W. Carroll Ave., Chicago 7, or —

Circle Inform-A-Gram No. A69.

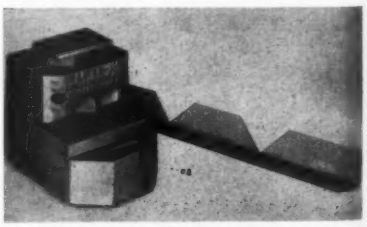
Cast Iron Collets have been produced for the automatic cutting-off machines manufactured by Modern Machine Tool Co., 2005 Losey St., Jackson, Mich. These collets prevent



or reduce scratches and mars on stock. They are divided into five moving segments to provide positive gripping of stock that may be slightly out of round.

Circle Inform-A-Gram No. A70.

Unipunch Series B 90° Vee Notching Units with 5½" shut height and 2 19/32" die height are for setups to notch angle and sheet material equivalent to and including mild steel up to ⅛" thick. These units



may be set up outside the press with no aligning, no adjusting, no press downtime, nothing attached to press ram. A one-piece extra high tensile holder casting eliminates distortion and misalignment. Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y.

Circle Inform-A-Gram No. A71.

Punches and Dies

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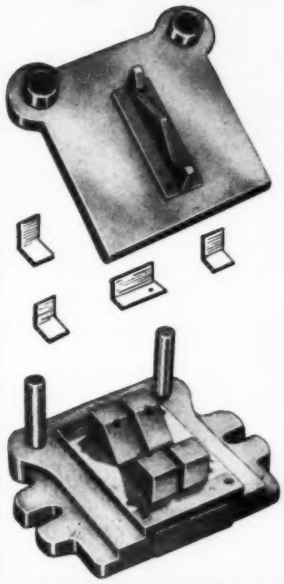

No. 18, cut off die, for 2" x 2" x ¼" and lighter angles. Mounted in leader pin die set. Fits 'most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.

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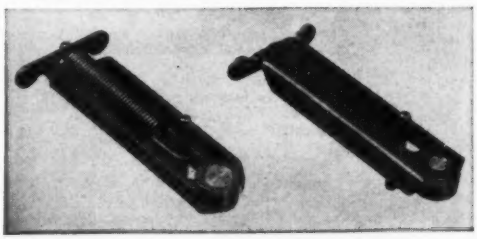

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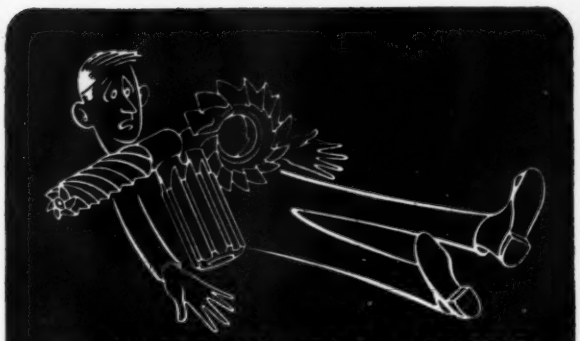

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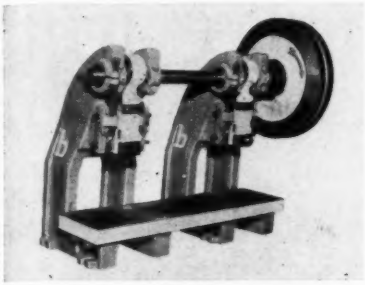
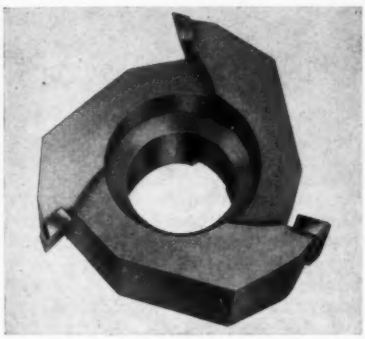
Serving as a Small Press Brake is this multiple ram setup. It consists of two 5-ton, fixed bed, gap frame Benchmaster presses operating in tandem from a single crankshaft



common to both presses. The crank with a stroke of 1⅛" operates at 230 strokes/min. This type of setup can be adapted to a wide variety of workpieces. Benchmaster Mfg. Co., 1835 W. Rosecrans, Gardena, Calif., or —

Circle Inform-A-Gram No. A72.

Designed for Face Milling Operations is series 400, 3 flute carbide tipped shell end mills for use with standard type "C" arbors. They also will produce a finer finish on aluminum, magnesium, brass or bronze



alloys, and plastic materials. Generous carbide tips protrude above cutter body to eliminate snagging the steel body with diamond wheel when regrinding and to save tool maintenance. Nelco Tool Co., Inc., Manchester, Conn.

Circle Inform-A-Gram No. A73.

For Welding All Metals and Alloys from 0.0002" to its capacity is the press type vertical spot welder for bench and pedestal mounting. It is also adaptable for wire butt welding. An advantage of this machine is a vertical shaft which moves up and down in ball bushings making its movement very sensitive, accurate, and sturdy. These welders are made in sizes ½ KVA to 5 KVA and are supplied with timing devices and transformers. Eisler Engineering Co., Inc., 750 S. 13th St., Newark 3, N. J.

Circle Inform-A-Gram No. A74.

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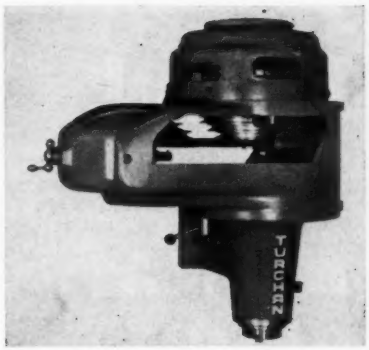
Circle Inform-A-Gram No. A75.



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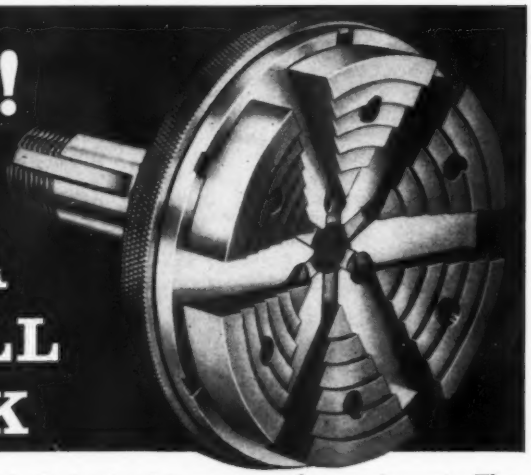
ALINA SCROLL CHUCK



A truly high precision chuck developed to meet exacting requirements. The method of clamping the largest possible area of the circumference permits minimum use of pressure; fragile work is never deformed or crushed. In order to maintain this advantage chucks over 4" capacity are equipped with eight jaws.

Removable jaws are available in a wide variety of styles for internal or external chucking, or they may be had in blank form suitable for your own machining.

Simple design permits quick and easy replacement of the shank, and shanks to suit special requirements may be machined at minimum cost in any shop.

Six sizes from 2" to 6" to fit all machines. Furnished with or without shanks.

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122 East Second St., Mineola, L.I., N.Y.

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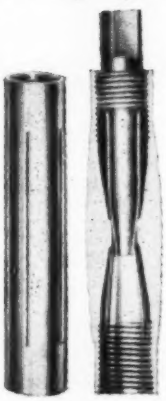
. . . without danger of galling or seizing!

The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15% — or more — under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel . . . simply turn adjustment screw.



Illustrated at left is Flexolap Set No. 1. Includes 8 complete laps, one of each size (3/16", 1/4", 5/16", 3/8", 7/16" and 1/2"), and one additional brass barrel of each size, all held on a sturdy, serviceable stand. Price complete $14.00

Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 3/16", use the Midget Lap. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps) $2.10

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FEDERAL TOOL CORP. 3600 Pratt Blvd., Chicago 45, U.S.A.

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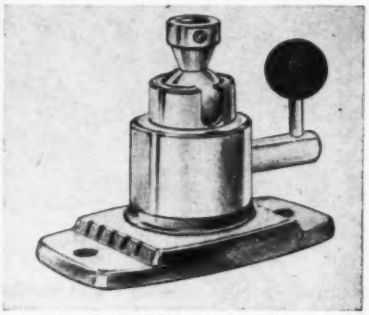
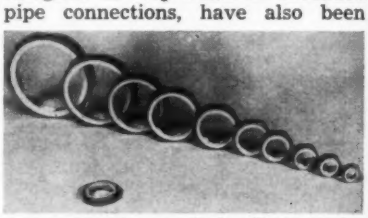
A Universal Work Positioning Fixture is used with vises or special work holding attachments to move work to any position in all three planes or for small assembly work. The Veep PowRarm will support a



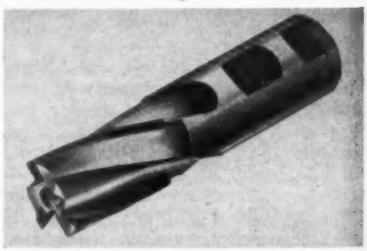
work load of 15 lbs at 6". This small, compact fixture features a new mounting method incorporated in the design. Other PowRarm models have carrying capacities of 5 lbs to 1000 lbs. Wilton Tool Mfg. Co., Inc., Schiller Park, Ill.
Circle Inform-A-Gram No. A76.

Great Resistance to Corrosion is provided by Tru-Seal self-sealing pipe fitting with a new surface treatment. Edges of the nut-like fitting, designed to stop leaks at threaded pipe connections, have also been



cropped and rounded off to make the device more compact. It is effective under pressures of 10,000 psi and under temperatures ranging from minus 200° to plus 500° F. Flick-Reedy Corp., 2040 N. Hawthorne Ave., Melrose Park, Ill.
Circle Inform-A-Gram No. A77.

A Series of Helical Carbide Tipped End Mills capable of higher feeds and speeds in many applications are available from Goddard & Goddard Co., 12280 Burt Rd., Detroit 23. The combination of positive rake and



true helix provides rapid chip disposal and freer cutting action. Standard stocked diameters of the end mills range from ⅜" to 2". Special sizes and designs are also available.
Circle Inform-A-Gram No. A78.

WELDON
"TU-LIP" COUNTERBORES

for
FAST, FREE CUTTING

As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest, freest cutting counterbore on the market.

Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.

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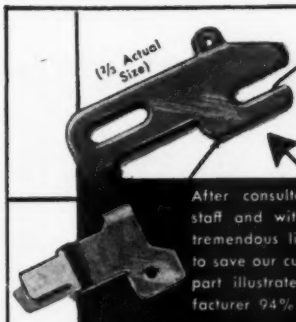
WRITE FOR LATEST CATALOG NO. 11.

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

CIRCLE INFORM-A-GRAM KEY NO. 1851



SAVED— $1,436.00 or 94%

After consultation with our engineering staff and with the use of dies from our tremendous library maintained specifically to save our customers time and money, this part illustrated actually saved one manufacturer 94% of usual production costs!

Price breakdown was as follows:

Tools	$89.00
Labor	.072
Material	.011

LOW die cost
FAST delivery
- Blanking
- Forming
- Piercing
- Drawing
- Extruding
- Stenciling
- Tapping
- Countersinking
- Plating
- Machining
- Painting
- Grinding
- Welding

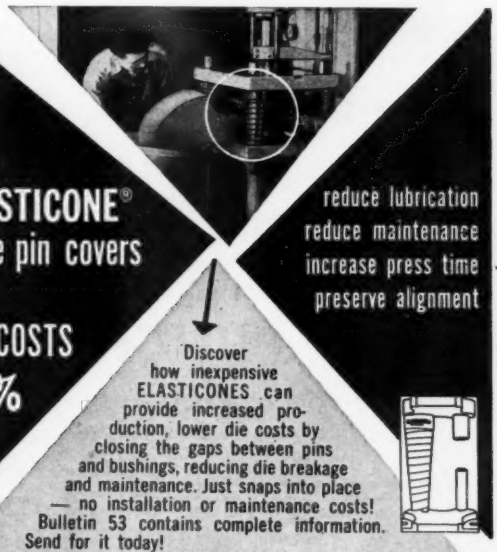
Yes, WLS SPEEDTOOLING for small quantity stamping needs is a saver every time! A radical production advancement, it eliminates most of the cost required for permanent dies. Finished parts are produced to tolerances as close as those from tools costing ten times as much. When jobs are completed WLS SPEEDTOOLING is stored for future use.

Use WLS for production quantities up to 100,000 when low cost, fast delivery, possible design changes for virtually nothing, are important factors!

FREE
1. Write now for a free sample part with a cost summary.
2. Our free bulletin also illustrates 40 small stampings.
3. Send in your blueprints to our engineering department for a prompt quotation.

WLS STAMPING COMPANY
3283 E. 80th Street • Cleveland 4, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1852


new
ELASTICONE®
guide pin covers
CUT
DIE COSTS
25%
reduce lubrication
reduce maintenance
increase press time
preserve alignment
Discover how inexpensive ELASTICONES can provide increased production, lower die costs by closing the gaps between pins and bushings, reducing die breakage and maintenance. Just snaps into place — no installation or maintenance costs! Bulletin 53 contains complete information. Send for it today!

CENTRAL Safety Equipment Co.
6603 MARSDEN ST. PHILADELPHIA 35, PA.

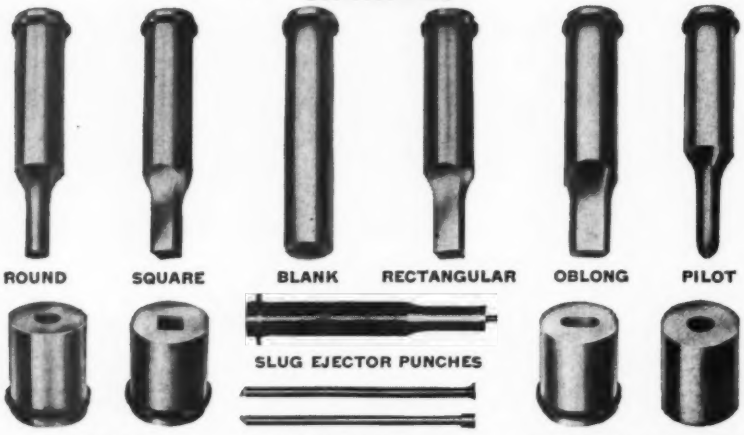
For complete information on Elasticones and a copy of Bulletin 53 use convenient coupon.

Name_____ Title_____
Firm Name_____
Address_____
City_____ Zone___ State_____
IP-857

CIRCLE INFORM-A-GRAM KEY NO. 1853

RING PUNCHES AND DIES

STANDARDS



COMPLETELY INTERCHANGEABLE
SHIPMENTS FROM STOCK
CHOICE OF STEELS
HIGH QUALITY
LONG LIFE
LOW COST

NEW!

PUNCH & DIE RETAINERS

Tough alloy retainers accurately machined for Ring Punches and Dies. Ease of mounting saves time and money.

SPECIALS

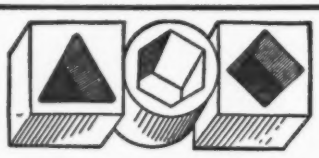
Send prints or sketches for quotation on your requirements. Prompt deliveries—reasonable prices.

WRITE FOR ILLUSTRATED CATALOG 105

RING PUNCH & DIE, INC.

19 FENTON PLACE JAMESTOWN, NEW YORK

CIRCLE INFORM-A-GRAM KEY NO. 1861



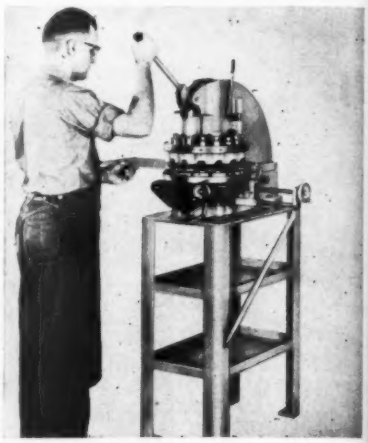
DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1862

JIG BORING
and
Large Precision Machining
Done to your specifications
We Have
21 Jig Borers
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1863

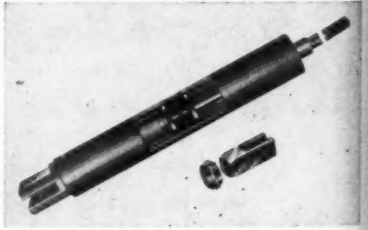
Pierce and Blank Holes from 1/16" to 2" in sheet material with a 4-ton, 12-station hand operated turret punch press. Designed for use in model shops and for short run production, the Di-Acro Turret Punch Press has micrometer type back and



side gages. These gages can be set at any point from maximum adjustment to the center of the smallest punch in 60 sec. In addition to punching sheet metal, the press can also be used with fiberboard, masonite, asbestos, rubber, and plastics. O'Neil-Irwin Manufacturing Co., 656 Eighth Ave., Lake City, Minn.
Circle Inform-A-Gram No. A79.

Aluminum Alloy Multi-Step Setup Blocks are used for faster setups on jig borers, boring mills, drill presses, planers, etc. They are soft enough to prevent damage to machine table finish yet strong enough to withstand heavy weight under clamping pressure. Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10.
Circle Inform-A-Gram No. A80.

Two New Lines of Cylinders have been announced by The A. K. Allen Co., 57 Meserole Ave., Brooklyn 22. Both Types AN and BN feature a fork type rear head for mounting, and fixed or adjustable cushions for



either end or both. Type BN (shown) uses cups for the piston head seals instead of O-ring packing as on Type AN. Double packing for the rod gland is also provided on Type BN. Both are available as double or single acting spring return.
Circle Inform-A-Gram No. A81.

Miller®

4 New Hydraulic Cylinder Features Benefit You 9 Ways ...At No Added Cost

MORE MILLER "FIRSTS"

NEW! ALL TEFLON SEALED AGAINST EXTERNAL LEAKAGE...

1. Eliminates Seal Damage from Fluids—Teflon is impervious to all Hydraulic Fluids (including Fire-Resistant Types) . . . Hydraulic Cylinders with Teflon Piston Cups Slightly Higher.
2. Eliminates Seal Damage from High Temperatures —Teflon Sealed Cylinders Operate At —100° F. to 500° F.

NEW! ROD BUSHING SEAL . . .

1. Eliminates Shearing of "O" Ring in Re-Assembly
2. Eliminates Extrusion of "O" Ring at Extreme Pressures.

NEW! SHEF SEAL AT TUBING ENDS . . .

1. Eliminates Shearing of "O" Ring in Re-Assembly
2. Eliminates Extrusion of "O" Ring at *ANY* Pressure—Teflon Sealing Ring is Backed Up by Zero Clearance Metal Shoulder.

NEW! LOCK-SEAL CUSHION ADJUSTMENT SCREW . . .

1. Eliminates Screw Projection Beyond Head and Cap — Cylinders Mount on Any Side.
2. Eliminates Manual Sealing and Locking After Flow Adjustment—Teflon Seal is Self Regulating and Self Locking.
3. Eliminates Accessibility Problems—Cushion Screw Interchangeable with Ball Check Position—Adjustable Through Small Wrench Hole Drilled in Interfering Machinery.

...lon Dont trademark for its tetrafluoroethylene resin

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Turn Page For Cross Section Of SHEF SEAL

S SEAL PROOF
H HEAT PROOF
E EXTRUSION PROOF
F FAIL PROOF
SEAL

Hydraulic Cylinder Tubing End Seal
PAT. APPLIED FOR

OTHER MILLER QUALITY FEATURES

- Case-Hardened Chrome Plated Piston Rod
- Rust Resistant Surfaces
- Teflon Oil and Dirt Wipers
- Interchangeable Square Design

Miller - FLUID POWER DIVISION

2046 N. Hawthorne Ave., Melrose Park, Ill.

...AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS

Miller®

Announces a New Space and Price Saving Hydraulic Cylinder Line

MORE MILLER "FIRSTS"

SAVE UP TO 76% OF COST

Heavy Duty Model LH—Same Size As Ordinary Gasket Type Square Design Low Pressure Cylinders

BORE	NORMAL RATINGS	NON-SHOCK INTERMITTENT RATINGS	YOU SAVE THIS % IN PRICE OVER STANDARD 2000-3000 PSI CYLINDERS
1½"	1500 PSI	2500 PSI	27%
2	1500	2500	27%
2½	1000	1500	28%
3¼	1500	2500	32%
4	1000	1500	35%
5	800	1200	37%
6	800	1200	43%
8	500	800	50%
10	500	800	71%
12	500	800	76%
14	500	800	*Not Available in 2000-3000 PSI*

Miller®

Announces 50% More Power Per Cylinder Dollar

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with Extra Heavy Duty

3000-5000 PSI MODEL H

HYDRAULIC CYLINDERS

Same Price and Mounting Dimensions as Miller 2000-3000 PSI Hydraulic Cylinders.

BOTH LINES MADE POSSIBLE BY SHEF SEAL

Miller - FLUID POWER DIVISION

H.K. AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS

OTHER MILLER QUALITY FEATURES

- All Teflon Sealed Against External Leakage—Teflon Cups Extra
- Case-Hardened Chrome Plated Piston Rod
- Shear Proof Rod Bushing Seal
- Ball Check Interchangeable with Self Sealing and Locking Cushion Adjustment
- Rust Resistant Surfaces
- Teflon Oil and Dirt Wipers

S SHEAR PROOF
H HEAT PROOF
E EXTRUSION PROOF
F FLUID PROOF
SEAL

Teflon Pressure Energized

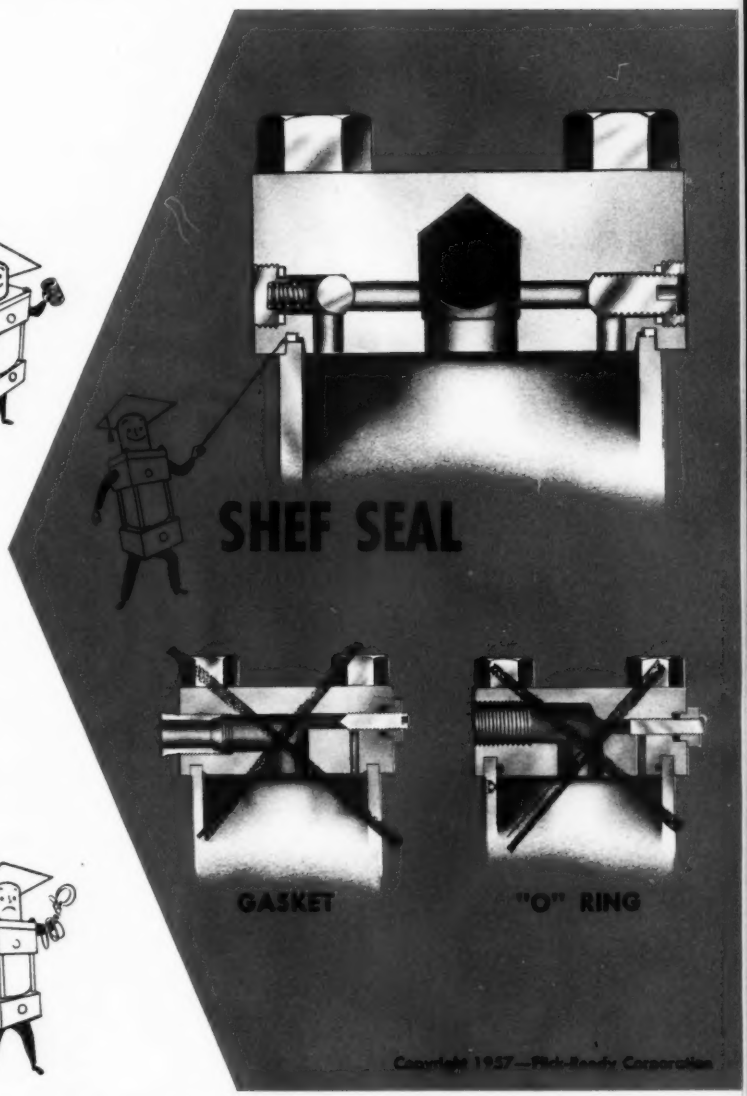
Hydraulic Cylinder Tubing End Seal

PAT. APPLIED FOR

SHEF SEAL Obsoletes All Other Hydraulic Cylinder End Seals . . . *at no added cost*

HAS EVERY ADVANTAGE

1. Pressure Energized—Sealing Effectiveness Increased with Pressure.
2. Zero Metal-To-Metal Clearance at all Pressures Gives You Perfect Seal Backup. Sealing Ring Cannot Extrude.
3. Simplified Servicing. No "Blind" Assembly. Sealing Ring Cannot Shear.
4. Teflon* Sealing Ring Withstands All Hydraulic Fluids at Temperatures from —100° F. to 500° F.
5. Head and Cap Axial Movement Does Not Destroy Sealing.
6. Allows Air Bleed In Head and Cap for Remote or Automatic Bleeding.
7. One Sealing Ring Cross Section Dimension For All Cylinder Sizes—Supplied On Convenient Spools.
8. Zero Metal Backup Clearance Eliminates Dangerous Leaks and Spurts of Fluid Due To Seal Failure.

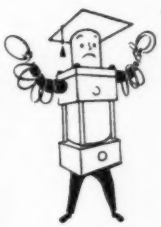


NONE OF THESE DISADVANTAGES

GASKET CONSTRUCTION

1. Unpredictable Results—Leaks and Blows Even at Low Pressures.
2. Outlawed by J.I.C. Eight Years Ago.
3. Seal Failure Causes Dangerous Leaks and Spurts of Fluid. Creates Unnecessary Fire and Safety Hazard.

"O" RING CONSTRUCTION



1. High Pressures and Shock Loads Expand Tubing—Increase Clearance and Cause Extrusion.
2. Blind Assembly Can Shear Sealing Ring—Difficult Servicing.
3. Seal Failure Causes Dangerous Leaks and Spurts of Fluid. Creates Unnecessary Fire and Safety Hazard.
4. Requires Large Inventory of "O" Rings
   —For Servicing Variety of Cylinder Bores.
   —For Special Synthetic Rubber Compounds To Meet Ever Changing Fluid and Temperature Needs.

*du Pont trademark for its tetrafluoroethylene resin.

SHEF SEAL—*Another Miller "First"*

When you buy Miller ... You buy extra years of worry-free Cylinder performance ...at competitive prices

S SHEAR PROOF
H HEAT PROOF
E EXTRUSION PROOF
F FLUID PROOF
SEAL

Hydraulic Cylinder Tubing End Seal
PAT. APPLIED FOR

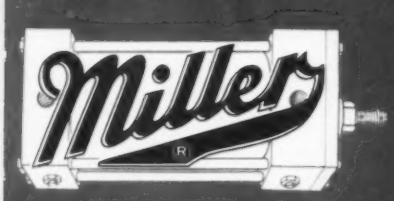
OTHER MILLER QUALITY FEATURES

- All Teflon Sealed Against External Leakage—Teflon Cups Extra
- Case-Hardened Chrome Plated Piston Rod
- Shear Proof Rod Bushing Seal
- Ball Check Interchangeable with Self Sealing and Locking Cushion Adjustment
- Rust Resistant Surfaces
- Teflon Oil and Dirt Wipers

Miller FLUID POWER DIVISION
FLICK-REED CORPORATION

Turn Page For More About MILLER

AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS



All Teflon Sealed —Perfect Sealing for Hydraulic Cylinders

HAS EVERY ADVANTAGE...

Teflon—As Static and Dynamic Seals

1. Impervious to Every Hydraulic Fluid Including Fire-Resistant Types.
2. Seals Perfectly in Cylinders at Temperatures from —100° F. to 500° F.
3. Can Be Molded Into Shapes That Have Zero Leakage—Hold Pressure Indefinitely.
4. With Proper Design of External Seal Cavities, Teflon Can Be Included *Without* Increasing Prices. Miller Provides Teflon for all External Seals at Prices Competitive with Ordinary Cylinders. Leather Internal Piston Cups are Standard (Teflon Cups Extra).

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Printed in U.S.A.

•du Pont trademark for its tetrafluoroethylene resin.

When you buy Miller
You buy extra years
of worry-free
Cylinder performance
...at competitive prices

NONE OF THESE DISADVANTAGES

Synthetic Rubber— As Static and Dynamic Seals

1. Unsatisfactory Except When Used With A Limited Range of Hydraulic Fluids.
2. Even Uncontrollable Changes in Fluid Additives Often Destroy Seal.
3. Specific Compounds Needed for Compatibility with Specific Fluids Normally Used Today.
4. Normal Temperature Range Limited to 0° F. to 130° F. Slightly Reduced Life When Operated at 130° F. to 150° F. Greatly Reduced Life at 150° F. to 250° F.
5. External Leakage Causes Fire and Safety Hazards When Temperature or Fluid Destroys Seals.
6. "U" Type Seals Without Mechanical Retainer at Mid-Section Frequently "Roll" and Lose All Sealing Ability.

Resin Impregnated Leather— As Dynamic Seals Only

1. Is Compatible with Many—But Not All—Hydraulic Fluids and Additives Including a few Fire-Resistant Types.
2. Normal Temperature Range Limited to —60° F. to 130° F. Slightly Reduced Life When Operated at 130° F. to 150° F. Substantially Reduced Life at 150° F. to 250° F.
3. External Leakage Causes Fire and Safety Hazards When Temperature or Fluid Destroys Seals.

Miller Uses Leather Piston Cup Seals for Internal Sealing... Standard Price (Teflon Cups Extra).

Piston Rings— As Dynamic Internal Seals

1. Most Piston Rings Allow Some Leakage.
2. Allow "Slip" or "Drift" of Piston Due To Leakage—Unsatisfactory for Many Applications.
3. Allow Varying Feed Rates Due To Leakage Because Of Viscosity Change During Startup—Unsatisfactory for Most Multiple and Automated Operations.
4. Allow Some Pressure Loss.
5. Chips and Dirt Enter Space Between Piston and Tube Causing Scoring —Especially During Startup.

All Teflon Sealed—*Another Miller "First"*

OTHER MILLER QUALITY FEATURES

- All Teflon Sealed Against External Leakage—Teflon Cups Extra
- Case-Hardened Chrome Plated Piston Rod
- Shear Proof Rod Bushing Seal
- Ball Check Interchangeable with Self Sealing and Locking Cushion Adjustment
- Rust Resistant Surfaces
- Teflon Oil and Dirt Wipers

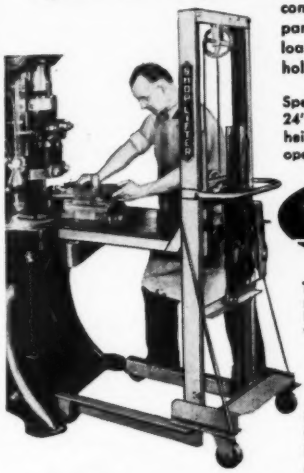
Miller FLUID POWER DIVISION
PICK-READY CORPORATION

2046 N. Hawthorne Ave., Melrose Park, Ill.

AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS • BOOSTERS

500 lb. Lifter-
NOW $210

Pays for itself over and over again in time saved and by avoiding lifting injuries in moving dies, machine parts and stacking. Can be used as adjustable height work table. Rugged, simple construction, with few moving parts, has high safety overload factor. Automatic clutch holds load at any height.



Specifications: platform 24" x 24", lifting height 4' 6". Overall height 6' 0". Width 24". Foot operated floor lock.

SHOPLIFTER

This sturdy, general purpose lifter makes it easy for one man to handle lifting jobs quickly and with complete safety.

Order Today—
Free Trial

specify 10 day free trial, with full credit return privilege. 1000 lb. and 2000 lb. Shoplifters also available.

ECONOMY ENGINEERING
4509 W. LAKE ST.
Chicago 24
Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1871

ONE
Clark LATHE TOOL HOLDER
Grips 3 bit shapes

Square Bits

Round Bits

Cut-off Bits

Threading Bits

Many Bit Sizes!

Clark LATHE TOOL HOLDERS do the *USUAL* and *UNUSUAL* JOBS BETTER IN EVERY SHOP—*SOLIDLY GRIP* ROUND, SQUARE and RECTANGULAR SHAPES—Enable turning, threading, boring with bars as well as cut-off operations with *ONE* tool holder!

Special vee clamp operating on diagonal accommodates several bit sizes, grips *full length of the cutter channel.* Holds bits tighter, eliminates chatter and harmonic vibration. Excellent rigidity for carbide tools!

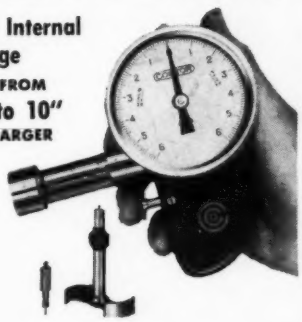
4 Clark Lathe TOOL HOLDER SIZES cover complete range of lathe requirements from ⅛" bits to ⅝" bits. Write for prices or order from your dealer.

Robert H. Clark Company
9330 Santa Monica Blvd., Beverly Hills, California

CIRCLE INFORM-A-GRAM KEY NO. 1873

Several of your home appliances probably were gaged with Comtorplug

Precision Internal Gage
SIZES FROM 1/8" to 10" AND LARGER

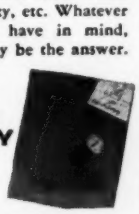


COMTORPLUG. Interchangeable expanding plugs gage simple or special bores from ⅛" to 10" diameter.

UNIQUE ADVANTAGES

- Large dial with .0001" graduations.
- Indicates actual size, a fixed — not passing — reading.
- Portable — no wire, hoses, stands or electronic gear.
- Positive 2-point gaging — automatic centering.
- Assured accuracy regardless of who operates it.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Will gage work in the machine.
- A shop tool for all-day every day use.

Anybody can use Comtorplug with positive accuracy . . . at machine, bench, lab . . . anywhere, since it's unencumbered by wires, hose, heavy base or electronic gear. The same amplifier fits all plugs and fixed readings show ACTUAL SIZE, front or back tapes, ovality, etc. Whatever problem bore you have in mind, COMTORPLUG may be the answer.



COMTOR COMPANY
82 Farwell St.
WALTHAM 54
MASS.

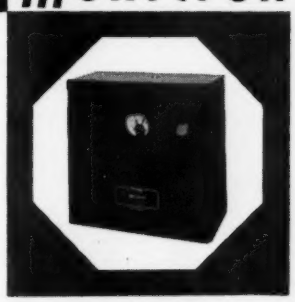
GET THE FACTS — REQUEST BULLETIN 50

CIRCLE INFORM-A-GRAM KEY NO. 1872

STOP

damage to machinery with automatic protection...

Sperry **monitron**



Stop damage from pile-ups, misfeeds, dull tools, oversize stock, faulty lubrication, etc.

Monitron senses load increase or decrease, stops motor, releases clutch, applies brake — before damage is done.

Monitron protects electrically driven presses, dieing machines, conveyors, pumps, automatic machine tools. Send coupon for full information.

Sperry **SPERRY PRODUCTS, INC.**
Danbury, Conn.

Please send me complete data on the Sperry Monitron.

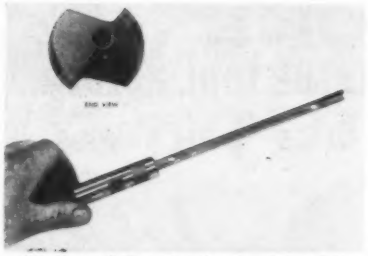
NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

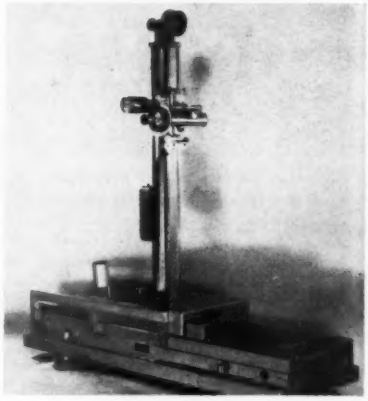
CITY_____ ZONE_____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 1874

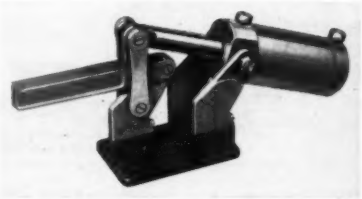


Designed for Producing Precision Blind Holes from the solid is the Center-Cut type of Starbore carbide drill. This drill can be applied to cast iron, aluminum, bronze, and some steel parts. Blind holes are produced in cast iron to 0.0005" size tolerance at a feed of 15 ipm. Surface finish of the hole is 30-mu, rms. Star Cutter Co., 34500 Grand River Ave., Farmington, Mich.
Circle Inform-A-Gram No. A82.

Reduce Inspection Time and Errors using a coordinate cathetometer. This new instrument makes both a horizontal and vertical measurement in a vertical plane at one setting. Precision measurements on large or inaccessible objects are easily made. Complicated castings, printed circuits, and bolt holes and bosses on large workpieces can be measured. Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14.
Circle Inform-A-Gram No. A83.



Recommended for Multiple Split-Second Positive Clamping is the Model 858 De-Sta-Co Air-operated Clamp-omatic. It delivers holding pressures up to 2,000 lbs with normal air line pressure of 90 lbs. Clamp expectancy under normal operating conditions, is at least 400,000 cycles. Detroit Stamping Co., 350 Midland Ave., Detroit 3.
Circle Inform-A-Gram No. A84.



A Complete Line of Hydraulic Cylinders is available in five bore diameters, from ½" to 1½", in stroke lengths to 36". Because of their small size, these cylinders may be used for actuation on many smaller products, and will conserve valuable space when used on larger products. A full line of cylinder mountings is also being produced. Oil-Dyne, Inc., 2117G W. Marquette Rd., Chicago 36.
Circle Inform-A-Gram No. A85.

with a

DI-ACRO* ROD PARTER

Make several thousand burr-free cuts per hour in bar stock

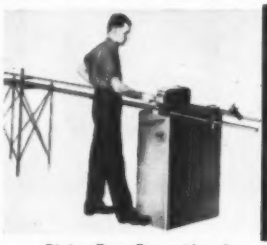
Combination shearing-breaking action parts bar stock without burring and minimum distortion. Handles up to ⅜" round bar stock—square, rectangular, and hex shaped bar stock can be parted when machine is equipped with special die heads.

Material range is from hot rolled bar stock to stainless steel and other high alloy materials. The harder the material is the better it parts.

Long lasting die heads can be reversed before resharpening—can be sharpened many times. Standard cutting heads in No. 2 and power models have 10 graduated holes from 1/16" to ⅜"; No. 1 Model has eleven holes. Optional die heads for parting scaly hot rolled bar stock *at not extra charge.*

Speed-Matic Gauge, an accessory on power model, enables machine to part off several thousand short pieces an hour. *Send us samples for test cutting or consult the Yellow Pages of your phone book for the nearest Di-Acro distributor.*

This ½" stainless steel bar stock has been "parted" in a Di-Acro Rod Parter. Shiny edges show where rod was sheared, then fractured or "parted off." Will clear hole its own diameter.



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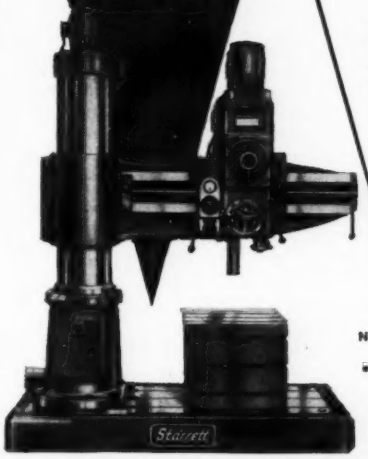

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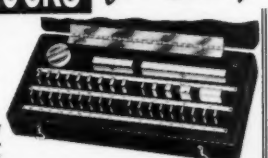

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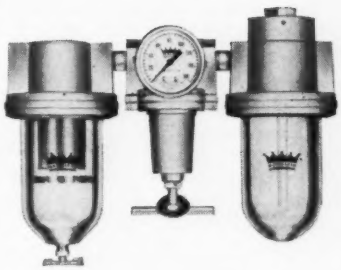

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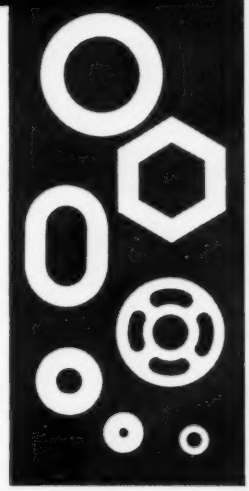

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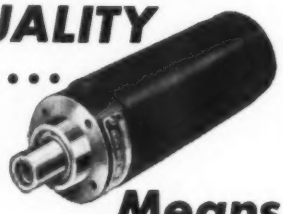

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